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[Erratum: In the article "Breakthrough in Soft X-Ray Laser Research Reported", published on page 16 of JPRS-CST-89-024, 1 Nov 89, the references to "lithium and silicon ions" and "lithium and aluminum ions" should read "lithium-like silicon ions" and "lithium-like aluminum ions", respectively.]

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High-Tech R&D Program (Project 863) Surges Ahead

90CF0045A Beijing ZHONGGUO KEJI LUNTAN
[FORUM ON SCIENCE AND TECHNOLOGY IN
CHINA] in Chinese No 5, 18 Sep 89 pp 8-10

[Article by Hu Haitang [5170 3189 2768], responsible editor Ge Yaoliang [5514 5069 5328]]

[Text] Since its proposal, China's high-tech research and development program (known as Project 863) has been in progress for more than 2 years. The progress may be divided into four stages: 1) The preparation stage. In October 1986 the Party Central Committee approved the development outline of Project 863 and the program was announced jointly by the Central Committee and the State Council. The program began in the beginning of 1987 and codes and regulations for organizational and financial management were established. Attention was given to the various avenues for funding applications, materials and external relations. 2) After an evaluation and selection process, experts were appointed to expert committees covering seven disciplines and to expert task groups on 15 topics. The expert committees now have 62 members with an average age of 72. The expert task groups have 106 members with an average age of 48. 3) Investigation and research has been organized and work on various topics has begun. 4) Specific tasks on research topics are being carried out. To date, the expert committees in the seven disciplines of biology, aerospace, lasers, automation, energy and new materials have made a basic assessment of the goals for the year 2000 and the tasks for the 1990's. Statistics show that as of the end of June 1988, more than 100 special topics were established, which were further divided into almost 1,000 tasks. More than 500 research units are participating directly in the project and nearly 10,000 science and technology staff are working on the research. In the meantime, about 2,000 people are working on the basic research of some 200 exploratory topics in the realm of new ideas and new concepts. These developments have amply demonstrated that the project has made a good start and is well under way; encouraging progress in some of the tasks has already been made.

In terms of organization and management, considerable effort has been exerted in order to move the new mechanism forward. The major developments are:

1. Clearly Establishing the Strategic Targets in People's Minds

In March 1988, leaders in the Party Central Committee were briefed on the work of the State Science Council by the Central Financial and Economic Leadership Group. The leading comrades of the Central Committee pointed out in that meeting that high-tech development in China should draw on the experience of the different paths taken in the past by the West and the Soviet Union. It should be strongly tied to the national economy and its results must play a major role in the development of the economy. Based on the spirit of their instruction, experts

in the various areas repeatedly studied the year-2000 goals and the near- and intermediate-term targets of Project 863 in order to clarify the thought process and to bring out the emphasis. Whenever a task is concerned with a target product, it is required that some near-term goal be achieved and that attention be given to the fast pace and rapid change of high-tech development. The overall goal of the computer integrated manufacturing systems (CIMS) project in the area of automation is to build an experimental production line by 1992, to acquire the basic component technology needed in a demonstration production line by 1995, and to complete a demonstration production line by the year 2000. Based on this final goal, the entire research program is also divided into three stages. For topics with yet undefined targets, such as intelligent computers and earth-space shuttle systems, the main task in the next 2 years will be to clearly define the goals.

2. Organizing the Attack on Major Problems

Many of the topics in Project 863 are often intimately tied to near-term and long-term goals; these topics are highly exploratory and should be studied by small research teams. For major target products, we need to coordinate an interdisciplinary attack on these problems. The organization of Project 863 is therefore divided into distributed small research teams and concentrated task forces. Since China has only limited financial resources, it is imperative that the manpower and material be concentrated. To this end, research centers are being established for some of the research topics, such as optoelectronics, CIMS, and robotics. Although these centers are relatively new, they have adopted selective and competitive procedures in site determination and responsibility assignment. Feasibility study reports were evaluated by peers and the implementation of the center tasks has created favorable conditions for superior talent here and abroad. The execution of the research tasks has displayed new vigor.

3. Results Have Already Been Obtained in Promoting International Cooperation

The development of high technology cannot be done by one country in an isolated manner; it must follow a road of openness. The pace of high-tech development can be picked up only by strengthening international cooperation. If China is to occupy a seat in the international high-tech arena, it must learn from other countries in order to remedy its weaknesses. In the last 2 years, experts have worked tirelessly in opening the avenues for international cooperation and obtained encouraging results. To date, the United States, Japan, France, Sweden, the FRG, and the European community have all expressed their willingness to cooperate with China. Some have actually entered into contracts with China to conduct specific work. Experience has shown that as long as the policy is properly set, partners for international cooperation can be found, even for sensitive high-tech items.

4. Annual Plans Are Executed Successfully With Good Results

Last year the expert committees in the different areas carefully examined the progress of the research tasks. In the five areas of biotechnology, information technology, automation, new energy sources and new materials, more than 95 percent of the tasks were completed according to schedule and only less than 5 percent were falling behind. Some projects have progressed quickly; for example, biotechnology has achieved several important breakthroughs. In the breeding of rice, Project 863 has made use of the existing research and has provided effective support in developing tens of stable new species with photosensitive nuclear sterile genes. This has allowed the breeding of rice to follow a "two-system method" instead of the "three-system method." Cross-breeding of rice in the two-system method has increased the rice yield by 50 percent over that of the previous three-system method. This new species will be test planted in 10,000 mu of rice fields this year. Cross-breeding of rice species between hsien rice and geng rice in the two-system method has produced a 20 percent increase in yield. This variety will be tested on a limited basis this year and, within 3 years, it will be tested nationally in 10,000 mu of test fields. These results not only have practical value for China's rice production, but also allows China to continue its status as an international leader in the cross-breeding of rice.

5. The Project Has Promoted Exploratory Research of New Ideas and Concepts

Project 863 tracks the development of high-tech on the international scene; its strategic targets are not technologies already in existence, but technologies at the end of the 20th Century and in the beginning of the 21st century. Many of the technological problems investigated under Project 863 are on the leading edge internationally; there are no existing conclusions to follow and we may explore the solutions on our own. This makes it imperative to have the guidance of basic research. For this reason, the experts in the various disciplines have paid special attention to the arrangement of applied basic research in the project. For example, in biology the research is divided into three stages. The first stage is the research and development of target products and the breeding of new species. The second stage is the applied basic research needed to achieve the target products and new species. The third stage is the exploration of new technologies and new methods for the purpose of technological reserves. The funding allocations are respectively 15 percent, 51 percent, and 34 percent.

When the applied basic research for Project 863 is compared to the ordinary basic research, the former has specific goals of application and stresses systematic understanding of the subject matter. It shares the commonality with basic research that both are pursuing the systematic understanding of the subject matter. The two also have some differences, but the differences are more in terms of the level of recognition and the approaches of

research instead of differences in the goals. Secondly, basic research in the area of engineering technology is stressed in Project 863. For example, there will be in-depth studies of the mechanism and principles of key and common technologies, functional devices and materials, and structural units and processing procedures. These interdisciplinary and integrated basic studies are aimed at the improvement and innovation of materials design and new system structures. Furthermore, the tracking of international standards proposed in Project 863 has a positive sense, rather than following others step by step. Since the key is innovation, we must have our own independent new ideas and concepts, as well as technological approaches and engineering processes that suit the situation in China. We will be able to combine the strengths of others with our innovative ideas only after we have a sound fundamental research base in engineering. To use the limited financial resources, the basic research topics in Project 863 are also arranged in a staged and coordinated manner with different priorities. Basic research tasks intimately related to the realization of strategic target technologies are given high priorities. Exploratory research tasks characterized by unique concepts, new theories and new technical approaches are developed with a lesser degree of support. To this end, a fixed percentage (2 percent) has been set aside from the total allocation of Project 863 and listed under the National Natural Science Foundation. The experts of Project 863 have provided research topic guidelines and participated in the evaluation. An exploratory research foundation is responsible for the implementation and oversees the funding of new concepts and new ideas in high technology with support from the National Natural Science Foundation. In 1987, 2,142 research topics were funded at a total of 9.81 million yuan. In 1988, 178 items were funded at a total of 8.01 million yuan.

6. Commercialization of Staged Results of Project 863

Although Project 863 is a medium-term and long-term R&D plan, close attention has been paid to the timely conversion of research results into products from the beginning of the program. The conversion of research results into products has undoubtedly a great promotional effect on the overall completion of the program goals and the linkage between scientific research and production and development. The commercialization of the technical results from Project 863 cannot be done without market study, capital investment, intermediate experiment, industrial tests and secondary development. In some areas the production units, the intermediate experimental units and the research laboratories have been organized into joint R&D centers. In March 1988, the Party Central Committee announced that high-tech R&D must also go toward openness and commercialization. In order to implement this directive and promote the rapid transformation of research results into industrial production, the state-organized Torch Project was put into action last year. In addition, high-tech companies have also been organized to promote the development of products, and to cultivate a team of talents

versed in both technology and management for a faster commercialization of research results.

7. Publicize the Work Conducted Under Project 863

To improve the interaction between departments and to better coordinate Project 863 and other scientific and technological projects of the country, coordination with the various departments and provinces and municipalities has been strengthened. In order to obtain greater support from society at large and from the various departments and local governments, the management method and operating procedures of Project 863 will be made public in an appropriate manner. Bulletins and briefs have been published by the expert committees regularly to inform the departments of the progress of Project 863. To attract talented people to work in Project 863, Project 863 Annuals and Project 863 Guides are planned for publication this year [i.e., 1989].

8. The Operation Will Be Managed by the Experts

The organizational measure of managing the high-tech programs in Project 863 by expert committees is a major reform in science and technology management. Recent evaluation of the management-by-expert practice has shown that this new management system has made good use of the expertise of the specialists in setting up the program, laying out the tasks, deciding the unit assignments, and allocating the funds. As a result, very few errors have been made and the high efficiency of an expert-managed system has been realized. We should also admit that there are still some problems with the management-by-expert approach. For example, the rights and responsibilities of the expert organizations at various levels should be clarified. The issues of how to involve the departments in Project 863 and how to improve the monitoring and management of finances are yet to be solved in the process of practice. The standard of management still needs to be improved in order to perfect the new system of Project 863.

1989-1991 National S&T Achievement Promotion Plan

90CF0045B Tianjin ZHONGGUO JISHU SHICHANG BAO [CHINA TECHNOLOGY MARKET NEWS] in Chinese No 495, 16 Sep 89 p 1

[Article by Qin Haiyan [4440 3189 3601]]

[Text] The 1989-1991 national S&T achievement promotion plan formulated by the State Science Council was recently put into effect. The first batch of 37 topics included cross-bred rice species and planting methods and new air-cooled bainite steel. The total cost of this year's plan is 400 million yuan.

Although China has achieved a great deal in science and technology in recent years, the promotion of research results remains a weak link. A gap exists between the promotion of and utilization of research results. For example, cross-bred hsien rice received a special national

award as early as 1981, but areas planted in it in the last 10 years amount to only one-third of the country's planting area for rice. The promotion of other results have also been in the 10-percent range and often limited to one plant or one location. The purpose of the national S&T achievement promotion plan is to broaden the scope of application for the research results. Achievements with clear economic benefits will be promoted systematically. Thousands of S&T workers will be utilizing thousands of research results. S&T achievements will be promoted at an unprecedented rate and scale and converted into productivity. Together with the "Spark Plan," the "Torch Plan," the "Harvest Project" and the "Blaze Project," this promotion plan will elevate the role of science and technology to major importance in economic development.

The total investment of this year's promotion plan is 400 million yuan. The first batch of 37 items has been promoted to more than 300 units in agriculture, conventional industry, and emerging industry. The promotion project is expected to have major impact on energy conservation, raw materials conservation, and environmental protection. An economic benefit of 4 billion yuan is anticipated.

Based on the national S&T achievement promotion plan, each province has formulated its own promotion measures. The provincial government of Hunan has made 1989 the S&T Achievement Promotion Year and clearly planned out the promotion of 1,500 items including 15 items of national priority and 120 items of provincial priority. The provincial science committee, together with departments under the provincial jurisdiction and municipal and local units, has promoted 10 major items valued at 100 million yuan. The prefectural and municipal science committees have worked with county departments in promoting and developing 100 items valued at more than 10 million yuan. The Hunan provincial government has also taken measures to direct social funds toward investment in S&T development and has increased the scope of S&T achievement promotion.

Key Laboratory Operating Subsidy Established

90CF0076B Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 20 Oct 89 pp 1, 4

[Article by reporter Han Yuqi [7281 3768 3825]: "Key Open Laboratory Operating Subsidy Funded"]

[Text] The State Science Commission recently decided to set aside an operating subsidy for key open laboratories. The fund will come out of the fundamental research budget which has been increased this year. The Ministry of Treasury has agreed to draw funds under this budget.

In the national fundamental research workshop held by the State Science Commission last February, Premier Li Peng stressed the importance of continuously emphasizing basic research to obtain sustained and stable growth. In order to ensure that the spirit of that meeting is implemented, the State Science Commission decided

to provide an operating subsidy to key open laboratories in order to support these key national and departmental laboratories; put the open, fluid and joint operating mechanism into effect; establish a good work style and academic atmosphere; initiate high-level research work; realize significant achievements; and develop talents to turn them into important bases for basic and applied research in China.

The State Science Commission also decided to accept applications for an operating subsidy from open laboratories this year. It has asked the National Natural Science Foundation to organize experts to review these applications. An operating subsidy will be given to qualified laboratories based on merit. All applicants must supply materials in writing to their managing department for review. Upon approval, all applications must be submitted to the State Science Foundation by 25 Nov.

Temporary Guidelines for Operating Subsidy to Key Open Laboratories

In order to promote development of basic and applied research, lead key open laboratories to set up a rational configuration, implement an open, fluid and joint operating mechanism, utilize existing research facilities and academic environments to the full extent, attract and gather outstanding researchers to conduct high-level work, establish good thought and style and academic atmosphere, produce better results and talents, the State Science Commission has decided to set up an operating subsidy for key open laboratories to support and reward outstanding laboratories.

Scope of Operating Subsidy

With the exception of laboratories involved in key national technical research projects or funded by special projects, all laboratories that meet the following two conditions can apply for this operating subsidy:

The laboratory's primary function is basic research or applied basic research, rather than an applied, developmental or pure testing-service laboratory.

It has already been certified or approved to be an open key laboratory. It must have been open to the society for over one year and is not limited to its own department or unit.

All applicants will be reviewed based on merit to determine which will be supported and what kind of subsidy they will receive.

Laboratory Evaluation

The key open laboratories applying for this operating subsidy will be evaluated by experts periodically using a competitive mechanism established based on the open reform policy. They will be ranked and the better ones will be supported.

Laboratories will be evaluated based on:

1. research assignments
2. research accomplishments
3. training of talent
4. degree of openness
5. team build-up and management level.

The State Science Commission will organize relevant experts to evaluate the applicants based on the above criteria. Scores will be given based on quantitative and qualitative means based on the materials submitted, necessary inspection conducted, and rebuttal provided. An overall score will be given after results are weighted.

The evaluation system and the scoring method are described in the following appendix:

I. The State Science Commission accepts applications for a one-time operating subsidy every three years. An approved laboratory will be subsidized until the year of the next round of applications.

In view of the fact that a large number of key national laboratories will be completed soon, the duration is shortened to two years for the immediate future. Applications will be accepted in 1989 and the next round will be in 1991. After that, the process will happen every three years.

II. Laboratories that qualify to apply for an operating subsidy may fill out the "application for key open laboratory operating subsidy report" and file written materials relevant to the contents of evaluation, in 15 copies, and send them to their managing departments for approval prior to submission to the State Science Commission.

III. After balancing different disciplines, the State Science Commission will give its final approval to the list of laboratories and amounts of support based on the review. The list will be released to the public.

As a matter of policy, the State Science Commission may provide an appropriate amount of subsidy to a small number of laboratories in disciplines where additional support is warranted.

IV. The key open laboratory operating subsidy is divided into the following four categories:

- (1) key national laboratories that are evaluated as excellent; no more than 10.
- (2) key national laboratories that are evaluated as good.
- (3) departmental laboratories that are evaluated as excellent; no more than 10.
- (4) departmental laboratories that are evaluated as good.

All subsidies are funded by the State Science Committee through the relevant managing departments charged with overhead.

V. All laboratories receiving an operating subsidy from the State Science Commission must submit an annual report, in triplicate, by 20 Dec starting from the second year. In the next round, they must re-apply.

VI. The key open laboratory operating subsidy is intended for water, electricity, gas, consumable reagents, and supplies to keep instruments and equipment in normal operation, and for the purchase of parts and maintenance costs to repair and maintain instruments and equipments. It cannot be spent to purchase instruments and equipment and any items other than those described above.

VII. Laboratories receiving this operating subsidy must be audited by the State Science Commission. If discrepancies are found in the reports, materials and statistics provided, appropriate actions will be taken accordingly.

VIII. This guideline is to be interpreted by the State Science Commission and is subject to revision after trial implementation.

Qian Xuesen on Socialist S&T System

90CF0076A Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 29 Sep 89 p 1

[Article by Qian Xuesen [6929 1331 2773]: "Establishing a Socialist Science and Technology System"]

[Text] In the past 40 years since the founding of our government, we, the technical workers, have made significant contributions to the construction of a socialist nation. Now, we must summarize what we have done and look into the future. How can we prosper with science and technology by dedicating ourselves to scientific spirits? I believe that first we must understand the world we are in today and be practical. When I met with Secretary General Jiang Zemin and Premier Li Peng on 7 Aug, Premier Li said "In this day and age there are quite different from the era of Newton, Watt, and Edison when an individual or a small group of people could do well in research and be innovative and creative. A modern S&T or engineering project involves complex systems engineering. It requires a collective effort to analyze and organize the work from a systems engineering standpoint." I believe Premier Li's comment is absolutely correct. I would like to discuss my own opinion based on my experience in the development of guided missiles and satellites.

First, in the late 1950's, we began working on defense-related cutting-edge technologies such as nuclear bombs, guided missiles and satellites. We organized these efforts based on systems engineering methods used to deal with large and complex projects. I feel this arrangement has two major characteristics. One is unified leadership. The leadership was provided by the Central Special Committee which was chaired by Zhou Enlai. Nie Rongzhen [5119 2837 5271] was in charge of the day-to-day affairs. This unified leadership was very powerful and effective. If the Central Special Committee decided to have a

certain department carry out an assignment, it would issue an order to that department to finish that specific assignment by a deadline. There was no room to argue because everything was top secret. That department would devote all its resources to compete the task without any reservation. This is unified leadership.

Second, the specific organization also took effective measures. Each project had a technical leader, called the chief designer. He was totally responsible for the technical issues regarding his project. Of course, he had a staff of advisers, called the general design department. It was a strong organization and was further divided into different design and R&D units based on systems. Each unit had a designer responsible for its assignment. Thus, the technical organization was very tight. This was the so-called technical command chain. The daily activities were also very complicated because it was an exploratory assignment. There were many changes; the original plan had to be modified once we encountered problems. This required an organization management department in charge of organization and deployment, which was called the administrative command chain. Everyone did a perfect job from the unified leadership provided by the Central Special Committee to the technical and organizational coordination by each individual task force. We truly executed the desire of the Party Central to have everyone vigorously support the effort.

In retrospect, I believe that this success was attributed to the fact that Zhou Enlai and Nie Rongzhen applied their experience in commanding large military forces to managing research and development of defense-related cutting-edge technologies. In addition, they put all the practical people available back then together and made it a success. I believe that we have to summarize this experience—i.e., the success in defense-related technologies from the 1950's to 1970's—when we talk about devoting ourselves to science and technology to vitalize our country. S&T must be applied to today's China in a practical way. Obviously, the present situation is quite different from then. Therefore, we need to be creative and have to establish a socialist S&T system.

Second, we must not be confused about what is happening today. We already made it happen some 20 years ago. Why can't we accomplish it today? This is related to the overall social environment and the time has changed.

Documents released by the Party Central often mentioned that our economic development strategy after the Third Plenum of the Eleventh Party Congress is divided into three steps. The first step is to double the 1980 gross national product (GNP) to provide food and clothing to the people. This has essentially been realized. The next step is to make people live comfortably by the end of this century. The third step is to have our GNP reach the level of an average developed country by the middle of the next century. The second step is a key step. Why? I believe that we could still use the old track and system during the first step. In the past 10 years, we have not made a great deal of changes. We have been successful

with the old method. Now, we are ready to take the second step. The old system does not work anymore; we have to switch to a modern socialist system to face the 21st century. This is not easy. In the past several years, we have not handled some aspects well. Why? I am afraid this is the reason: The old way does not work anymore and we have to switch to a new system. How do we go about it? We don't know the answer because there are no precedents to follow. The capitalist system is for reference only and cannot be copied because of the drastically different social system. Most socialist countries are in trouble. In terms of reform, China is ahead of them and there is no one to follow. Next, we clearly insist on the four fundamental principles. In order to open up to the outside and to carry out reform we have to establish the new concept. However, it is not that easy and requires us to explore on our own. How can we make no mistakes? If one thinks this way I am afraid he is not a Marxist. There is no way we can guarantee that every step we take is correct. This point has been proven in practice. By the year 2000, we must understand the basic system. Once it is understood, we can make further

progress in the next century. The most difficult thing to do is to switch from an old system to a new system. This is why the second step is a key step. As technical workers, we must have this concept in our minds. We must have the courage to explore in order to see tomorrow today.

We must not and will not be afraid of difficulties, because we have Marxism and Mao Zedong Thought—which are the crystallization of human intelligence—as the theoretical basis to guide us. In addition, I believe that we have found a scientific method to deal with such a complex systems engineering project. This is not an ordinary complex system. Instead, it is a huge and open complex system. We have already successfully tried out this method. Therefore, we, the technical workers, must have confidence that we are on the right track. Dawn is in sight. Let us struggle together.

(Excerpts from Qian Xuesen's speech on 21 Sep in the "developing scientific spirit, devoting ourselves to science and technology to vitalize our country" conference held by the Chinese Science Association).

Lop Nur Test Base, Its Contribution to Nuclear Weapons Development

40081005a Urumqi XINJIANG RIBAO in Chinese 15 Oct 89 p 1

[Summary] In 30 years of construction, the Chinese nuclear test base located in the Taklimakan Desert, Xinjiang Autonomous Region, has become a modern, comprehensive nuclear test center. The base has made significant contributions to the development of Chinese strategic nuclear weapons, strengthening national defense and promoting science and technology development, and to peaceful applications of atomic energy. The test base was founded in June 1956, with the involvement of Chairman Mao Zedong and Premier Zhou Enlai. To counter the Imperialists' monopoly on nuclear

weapons, scientists, technicians, PLA officers, workers and students from all over the country were assembled in Lop Nur to construct China's first nuclear test base. Despite extremes in weather conditions in the region, the team finally succeeded in producing its first atom bomb on 16 October 1964. The nation's first guided missile nuclear weapon was tested 2 years later, and its first hydrogen bomb test conducted 2 years, 8 months after that, followed by its first underground nuclear test. The test base has worked hard to strengthen its science and technology research capability. To date, more than 1,500 Invention Awards and 10 National Science and Technology Commission awards have been awarded to the base. These achievements provided a strong foundation for the development of the nation's nuclear weapons.

X-Ray Topographic Study of Slip Dislocations in GaAs Crystals

906A0002A Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 8, Aug 89 pp 1344-1347 [MS received 16 Sep 88]

[Article by Mai Zhenhong [7796 2182 3163], Ge Peiwen [5514 1014 2429], He Jie [0149 2638], Cui Shufan [1508 2885 5400], and He Chuguang [6320 2806 0342] of the Institute of Physics, Chinese Academy of Sciences; as well as Ma Bichun [7456 4310 2504], Chen Jianbang [7115 1017 6721], and Wang Yonghong [3769 3057 7703] of the Beijing Nonferrous Metals General Research Institute]

[Abstract] GaAs integrated circuits are of marked importance because of their advantages of high speed and low power consumption; these integrated circuits are fabricated on a semi-insulating GaAs substrate through a series of electronic processes. Hence, impurities, flaws, and crystal lattice mismatch between the substrate and epitaxial layer in the semi-insulating GaAs material directly affect the quality and yield rate of the integrated circuits.

In recent years, measures of the In-doping type have been adopted, thus greatly enhancing the dislocation density of GaAs single crystals. Studying dislocations in GaAs crystals is helpful in understanding the dislocation-generating mechanism in the crystal growth process. In this study, slip dislocations in In-doped and undoped GaAs single crystals are investigated by X-ray topography. Different configurations of the slip dislocations were observed, resulting from the different dislocation densities. The mechanism of slip dislocations and the formation of the cellular network structure are discussed in general.

Seven figures show X-ray topographic diagrams of In-doped and undoped GaAs single crystals, distribution of the calculated Schmid factors in the (001) plane, the trend loci of type A and B slip dislocations, and schematic diagrams indicating the mechanism of these two slip dislocation types.

The authors are grateful to Wu Lansheng [0702 0356 3932] and the late Fu Quanguai [0265 0356 6311] for their assistance in the experiment.

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X-Ray Study of Crystallography in NaBiTiO Ferroelectric Ceramics

906A0002B Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 8, Aug 89 pp 1348-1353 [MS received 25 Oct 88]

[Article by Zhou Fang [0719 2397], Xu Yueying [1776 2588 5391], Li Deyu [2621 1795 1342], He Chongfan [0149 1504 5672], Gao Min [7559 2404], and Wang Tianbao [3769 1131 1405] of the Shanghai Ceramics Institute, Chinese Academy of Sciences]

[Abstract] In a particular composition range, the $(\text{Na}_{0.5}\text{Bi}_{0.5})\text{TiO}_3\text{-BaTiO}_3$ (NBT-BaTiO₃) system is a new kind of ultrasonic-transducer material with good and unique features. By means of X-ray powder diffraction, the authors precisely determined the cell parameters of NBT and propose a new type of lattice structure, differing from the structure studied in previous reports. For this system, the lattice parameters for different compositions were determined. The relationships between properties, cell dimensions and compositions as well as the phase relation are also discussed.

One table lists NBT crystallography data and X-ray powder diffraction data. Three figures show an electron diffraction photograph of a selected region of NBT, cell parameters and volume at different composition points of the NBT-BaTiO₃ system, as well as a comparison between the NBT monoclinic cell measured in this experiment, and the hexagonal lattice unit of the Ivanova trigonal system.

The paper was publicly read at the fourth session of All-China Structural Chemistry Symposium, Fuzhou in November 1988. The authors are grateful to engineer Song Xiangyun [1345 4382 0061] for making the electron diffraction analysis, and associate researcher Zhu Binghe [4376 3521 0735] for providing the related materials.

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Study of Erbium-YAG Laser Crystals

906A0002C Beijing GUI SUANYAN XUEBAO [JOURNAL OF THE CHINESE CERAMICS SOCIETY] in Chinese Vol 17 No 4, Aug 89 pp 348-354 [MS received 30 Jul 88]

[Article by Li Fenyu [2621 4720 3768], Rong Zimei [2051 1131 2734], and Zhong Yongcheng [6945 3057 2052] of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Abstract] Erbium-yttrium-aluminum garnet (EYAG) crystals up to 23-25 millimeters in diameter and 100-120 millimeters long with different Er-ion concentrations (15-100 percent activation) were grown successfully from melt by the Czochralski technique in the laboratory. Measurements of optical parameters were made, such as refractive indices, absorption and luminescence spectra of the crystal. A 2.938-micron wavelength EYAG laser was constructed with a 50-percent activator concentration; this type of EYAG-crystal-based laser can be intensively absorbed by biological tissues, and thus it is suitable for precision surgical operations. Finally, the approach for improving the laser efficiency is also discussed in the paper.

Three tables list the Er^{3+} concentration in crystals compared with that in melts, the laser-rod extinction ratio, and refractive indices of the EYAG crystal. Seven figures show the absorption spectrum, crystal field splitting scheme, 3-micron luminescence spectrum, Jamin interferograms, and 2.938-micron laser spectrum of EYAG crystal; as well as a schematic diagram of the apparatus for the laser experiments and luminescence spectrum determination, and oscillograms of pulses of the pump light (pumping threshold = 100 Joules) and excited radiation.

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Investigation of Crystal Growth, Properties of Doped KTP

906A0002D Beijing GUI SUANYAN XUEBAO [JOURNAL OF THE CHINESE CERAMICS SOCIETY] in Chinese Vol 17 No 4, Aug 89 pp 363-367 [MS received 4 Jan 89]

[Article by Wei Jinqian [7614 2529 6197], Liu Yaogang [0491 5069 1511], Wang Jiyang [3769 4949 2254], Shi Luping [2457 6424 1627], and Zhang Jiguo [1728 0679 2654] of the Institute of Crystal Materials, Shandong University]

[Abstract] KTP (KTiOPO_4) is a highly efficient frequency-doubling crystal. In the authors' institute, the largest high-quality single crystals consistently grown are 65 x 50 x 30 millimeters in size; from these single crystals, the largest frequency-doubling devices fabricated have dimensions of 17 x 17 x 10 millimeters.

For even higher double-frequency efficiency and anti-light-damage threshold value of KTP crystals, the authors attempted to enhance the quality and properties of KTP crystals by doping. The paper reports on changes in crystal growth and properties of KTP crystals doped with Rb, Cs and/or As. Based on the relationship between the crystal structure and properties, they also discuss the results with data listed in three tables in the text: dopant concentrations in the solute and crystal (percent activator), SHG [single harmonic generation] phase-matching angles for doped KTP crystals, and experimental data for SHG of the CRTP crystal.

Three figures show the relationship between As concentration in the solute of the flux system and in the crystal, the surface topography of the (100) face, and the surface topography of the (011) face. The authors are grateful to Xie Fengjuan [6200 7685 1227] for conducting the growth experiments, Yang Zhaohe [2799 0340 5440] for measuring the absorption spectra, and Yue Shubin [1471 2579 2430] for making the constituent analyses.

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Molecular Breeding Technique Developed

40081004a Beijing RENMIN RIBAO [OVERSEAS EDITION] in Chinese 8 Nov 89 p 1

[Summary] A new bioengineering breeding technique to control crop genetics has been developed by Chinese scientists after 11 years' research work. By introducing foreign DNA into the test plant, the scientists have succeeded in producing highly selective cotton and rice varieties. A new variety of early-ripening drought-resistant rice plant was thus produced by inserting the DNA of early-ripening purple corn into a rice plant, and is now being tested in suburban Beijing.

Space Microgravity Gyrotor Developed

40081004b Beijing RENMIN RIBAO [OVERSEAS EDITION] in Chinese 8 Nov 89 p 1

[Summary] The first space microgravity gyrotor for biological experiments has been developed by the Shanghai Institute of Plant Physiology. The gyrotor is composed of three sets of convertible culture compartments (tubes); one of the three compartments (tubes) is for magnetism compensation control, while the other two compartments (tubes) are for ground simulation microgravity tests. Test are focused on cellular changes in suspended culture media, growth conditions of a single plant in space, and the physiological and biochemical reactions of small animals, such as rabbits, in space. The gyrotor can effectively simulate the microgravity environment and radiation conditions in space. The data collected from the tests will be used to provide information for the further study of drug production, biological sciences research and the establishment of controlled ecological agriculture in space.

Survey of Immune Effects, Persistence of Chinese-Produced HB Blood-Origin Vaccines

40091003a Beijing ZHONGHUA LIUXINGBINGXUE ZAZHI [CHINESE JOURNAL OF EPIDEMIOLOGY] in Chinese Vol 10 No 4, Aug 89 pp 203-205

[English abstract of article by Liu Zhenqiang [0491 2182 1730], et al., of Shandong Provincial Epidemic Prevention Station, Jinan]

[Text] A three-year systematic community survey was conducted in order to observe the immunization effects and persistence of the 843-1 batch of HB vaccine produced by Beijing Biological Products Research Institute, affiliated with the Ministry of Public Health. The results showed that the vaccine was safe and reactions were slight. The antigenicity and short-term immunization effects were good. After three years, the positive rate and the P/N value of anti-HBs dropped considerably. This suggests that three years following immunization, a booster injection should be given to improve the immune level.

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Characterization of Nuclear Polyhedrosis Virus DNA from Buzura Suppressaria

40091003b Wuhan WUHAN DAXUE XUEBAO-ZIRAN KEXUE [JOURNAL OF WUHAN UNIVERSITY-NATURAL SCIENCE EDITION] in Chinese No 3, Sep 89 pp 91-96

[English abstract of article by Chen Hailei [7115 3189 7191] and Liu Niancui [0491 1628 5050] of the Department of Virology and Molecular Biology, Wuhan University]

[Text] The range in size of the Buzura Suppressaria NPV occlusion body was approximately 1-1.5 μm with a polyhedron shape, while the virion was rod-shaped, 0.31-0.34 μm in length and 0.05-0.06 μm in diameter. T_m of the viral genome in a 0.1 x SSC solution was 76.5°C. The (G+C) content determined by T_m was 55.14

percent. The average length of the BsNPV DNA determined by electron microscopy was 41.3 μm , corresponding to a molecular weight of 81.36×10^6 daltons. The viral genome was examined with restriction endonuclease, single and double digestion DNA using BamHI/Bgl II, and KpnI/XhoI, etc., and analyzed in approximately 0.7 to 1.0 percent agarose gel electrophoresis, the result of which showed a total molecular weight of the DNA genome of 79.35×10^6 daltons (120.23 kb). The length of the DNA fragment was calculated using Southern's formula in a computer.

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Isolation, Preliminary Characterization of Bacteriophage for Alkalophilic Bacillus Sp No 42-14

40091003c Wuhan WUHAN DAXUE XUEBAO-ZIRAN KEXUE [JOURNAL OF WUHAN UNIVERSITY-NATURAL SCIENCE EDITION] in Chinese No 3, Sep 89 pp 100-104

[English abstract of article by Tao Tao [3221 3447] and Lu Zhiyu [7120 1807 1342] of the Department of Virology and Molecular Biology, Wuhan University]

[Text] A bacteriophage, AL-W-1, capable of infecting alkalophilic Bacillus sp. No. 42-14, was isolated from alkaline soil in Wuhan and preliminarily characterized. An electron micrograph of phage AL-W-1 showed that the phage had an icosahedral head attached to a long tail. The host range of AL-W-1 is narrow. The phage grows optimally at pH12, but is stable within the range of pH4-12. All of the phages were inactivated at 60°C for 20 minutes.

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PRC and ROC Cooperate on Standardizing Computer Chinese

40080237b Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese
No 32, 16 Aug 89 p 1

[Article by Du Haiping [2629 3189 5493]: "Both Sides of the [Taiwan] Straits Will Jointly Offer a Proposal for an International Standard for Multiple 8-Bit Chinese-Character-Coding Character Sets"]

[Text] Chinese-character-information interests on both sides of the [Taiwan] Straits have joined this year to offer a proposal to the ISO for an international standard for "multiple 8-bit Chinese-character coded character sets." And in September next year [1990], they will jointly participate in the "Chinese People of the World Computer Chinese-Character Input Exhibition Match" to be held in Hong Kong, which will further stimulate the application and development of Chinese text computing throughout the world.

These two resolutions were produced by experts from both sides of the Straits who are engaged in standardizing Chinese-character information and who were at the "Conference on Chinese-Character Information Standards" held at the Xiangshan Hotel in Beijing recently. Professionals from both sides of the Straits met in April this year in Hong Kong, where they fixed the "Technology Working Group for Chinese-Character Information Standardization" as agreed by both sides, which has enhanced discussions and exchange efforts on both sides of the Straits toward the standardization of Chinese-character information. This occasion was the first for both sides to meet on the mainland, where they held intensive working sessions.

After 2 days of ardent and harmonious discussions on 1-2 August, accord was reached by both sides on many issues, and 4 special groups—the Chinese textual coding group, the Chinese-character typeface group, the Chinese-character input method group, and the Chinese textual basic research group—gave reports on short- and longer-term cooperation to the conference. The conference was originally scheduled for 3 days, but because both sides were so close in thinking, the atmosphere so congenial, and the work so diligent, it was smoothly concluded in 2 days. The Hong Kong Information Technology Promotional Society had also sent 2 representatives to the conference. Both sides expressed their satisfaction with the results of the conference.

The conference also resolved to accept ISO and IEC [International Electrotechnical Commission] information handling terminology standards (some 5,000 terms) as a standard to produce a comparison chart of noun terminology from both sides (and including the English as reference), and that to as great an extent as possible, new terminology in the future will be uniform. Both sides also made detailed plans for various typeface standards in the standard character sets. Because Chinese textual computer standardization efforts tend more

to involve systems software than do those for non-Chinese text, some delegates also proposed that another group be formed—a systems software special group.

Because of shared needs and thinking, it is expected that this close cooperation between circles on both sides of the Straits will become ever more broad and effective.

Navy Develops Computer-Aided Plotting Technology

40080237c Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese
No 32, 16 Aug 89 p 1

[Article by Wu Baoyuan [0702 1405 3293]: "Use of Computer-Aided Plotting Technology to Draw All-Important Navigation Charts Is Successful"]

[Text] In Tianjin recently, the Navy Mapping Institute used the A/C-RAMS automatic plotting system to successfully plot China's first complete set of computer-drawn essential navigation charts for both military and civilian usage; this accomplishment represents an important breakthrough in the transfer of computer plotting technology research achievements into production.

This system consists of one HP 1000-A900 minicomputer, four interactive dual-screen drawing workstations, a drum-type high-speed automatic plotter, and a large platform-style high-precision automatic plotter. The software designed and developed by the Marine Mapping Institute successfully resolved such technical difficulties as the automatic conversion and piecing together of such different plotting materials as different projections and different scales; the automatic copying of arbitrarily complex marine chart symbols; the automatic renewal of plotting materials; and the automatic engraving of various marine chart borders.

Focusing on artwork, marine charts, and physical maps of differing projection and scale, this system has supplemented those materials with sea chart #12583 that has been newly plotted from navigation announcements, navigation signal reports, and a succession of harbor charts, in which every specification complies with marine chart standards and with chart requirements. This chart has been approved by Navy Headquarters Department of Navigation Security, and has been officially published.

This system can handle various graphics or digital materials, and it can formulate and verify entire automatic plotting technique programs, and with high quality can output engraved line-drawn pages, tear-off film plates, and optical plots, and can speed-plot high-quality color inspection drawings, all appropriate to the needs of printing. Referring to whatever databases have been built, the system can print out entity data and entire analytical reports; it can automatically generate reports on materials used; and it has on-line graphics search. Use of this system can reduce map-generation time, can

enhance marine-chart feasibility, and can improve chart-drawing precision. Through verification and clarification, there are always fewer errors regarding marine chart plane positioning, and at the same time, it lessens the intensity of labor for the people drawing the maps, and improves working efficiency several times over.

The successful development of this system provides an advanced means for handling the steadily increasing variety of digital measurement materials and for generating map products from different numbers, thus forwarding the development of marine chart plotting theory.

Increasing Demand for Computer Networking in Shanghai

40080221c Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 28, 19 Jul 89 p 2

[Article by Lao Chengxin [0525 6134 0207]: "Demand for Computer Networking in Shanghai Grows Steadily"]

[Text] In recent years, the need for computer networks in Shanghai has grown steadily, and many departments have begun the development of computer network applications, from which they have obtained economic and social results. These computer network applications may be summarized in the following categories:

—Microcomputer Local-Area Networks (LAN's)

Medium to large enterprises have been developing microcomputer LAN's primarily as management aids. Typical systems include the New Shipyard, Shanghai Electric Cable Plant, Shanggang [i.e., Shanghai Steel] Plant No. 3, and Shanghai Hydraulic Plant No. 3. As an example, there are nearly 50 PC XT and PC AT microcomputers at Shanggang Plant No. 3, among which 16 are incorporated within 3 Omninet LAN's, and another 16 are connected to the LAN's in a looser information network via modems. These computers are used for the management of finances, technology, quality, production planning, personnel affairs, equipment, goods and materials, and measurement; these activities have speeded the circulation of information; improved overall capacity for handling data, work efficiency, and the level of management, and have increased economic results. Because of a faster feedback of financial information alone, some 8.8 million yuan has been generated.

—Communications Networks

This kind of network links all microcomputers in each office and workshop throughout a plant by means of modems and the plant area telephone lines. This forms a communications network where the primary function is data transmission. Typical systems are the information management system at Shanggang Plant No. 5 and that of the Shanghai Agricultural Bank. In accordance with its own situation, the latter system begins with microcomputers; most of its development has concentrated on

a banking-profession data information network primarily using floppy disks and remote data transfer.

—Regional Dedicated-Line Networks

This sort of network is composed of equipment from computers and digital terminals to transmission and [telephone] exchange equipment, all provided by the users themselves; transmission distances are greater than for LANs, and resource sharing is also a goal. For example, there is the campus computer network management system at East China Teachers' University that is formed from VAX 11/750, Micro VAX-II, F9450 II, Apple, PC, and PC-NET computers. This network accomplishes the switching of computers used for such varied functions as centralized batch processing, "real-time" connections, remote batch processing, and distributed computer. In this way, expensive peripherals can be used by many systems, and it reduces program and data conversion among different computer systems, as well as the porting of software among those systems. Excellent results have been obtained from the resulting advancements in teaching and in the modernization of administrative management.

—Multi-User Mid-Sized Computers

Typical systems are the enterprise information management systems at units of the Hudong [i.e., East Shanghai] Shipyard and the Shanghai Computer Plant.

—Urban Leased-Line Networks

This is where data lines leased from posts and telecommunication departments are configured for and link such equipment as customers' own computers. Network systems of this kind are at present mostly subscriber data-transmission networks. The Shanghai Municipality Planning and Statistics System, the Science and Technology Report Retrieval System, the Goods and Materials Information System, and the Foreign Trade Customs System are all data-communications systems of this type. For example, four IBM 4381 computers and more than 100 microcomputers at Shanghai Municipal Bank of Industry and Commerce comprise central-district and north-district computing centers, leasing exclusive municipal telephone circuits; from this has been developed a network system for public service and savings sectors. Then Shanghai Office of Goods and Materials has a three-level network system formed from office—company—base levels. Goods and materials are shared this way, and it has brought management of goods and materials into a scientific and rational new stage. The Science and Technology Report Retrieval System has solved problems with communications technology among different kinds of computers; it has implemented host-to-host computer communications and distributed report retrieval between Shanghai Jiaotong University and Fudan University; and it has implemented computer communications among minicomputers at both Jiaotong University and higher institutions, as well as between microcomputers and mainframes. They are

currently working on building databases and the implementation of sharing of intra-urban report resources.

It is understood that on the networks just described, there are more than 20 such medium to large computers in operation, including the IBM 4341, IBM 4361, IBM 4381, M150, VS300, ACOS300, PDP 11/70, and VAX 780. The rate of transmission is generally 2,400 bits per second.

—Remote Communications Network

In building networks, a small number of systems also lease long-distance communications circuits, for remote communications between cities.

Chinese-Made 44-Megabyte Hard-Disk Drive Is Now Available

40080237a Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 30, 2 Aug 89 p 1

[Article by Tian Feng [3944 0023]: "Model 1050 Winchester Disk Drive Goes on the Market"]

[Text] The JN1050 5.25-inch Winchester disk drive, one of the key S&T projects during the period of the state Seventh 5-Year Plan, has been successfully developed by the Hunan State-Run Jiannan Machinery and Equipment Plant, which recently began small batch production for market sales.

This is yet another major accomplishment for this factory. According to an evaluation by experts, each technical specification of this new product attains the advanced level of current foreign products of a similar type, and has brought the capacity of domestically manufactured Winchester drives from 20 megabytes to 44 megabytes; this indicates that China's computer industry has made a breakthrough step forward.

The Winchester drive is the primary magnetic recording device for computers when storing both text and binary information. Before the mid-1980s, this type of equipment was at a level that was small in both size and capacity, whether abroad or in China, and 2 years ago, one or two developed nations could only use such new technologies as closed-loop systems, servosurface encoding, and voice-coil motors in bringing out the model 1050 5.25-inch Winchester drive, before storage capacity could be improved to 40 megabytes (that is more or less the capacity of 400 books, each having 100,000 characters), and which catapulted magnetic recording equipment into a new era. The Jiannan Machinery and Equipment Plant took aim at this advanced world technology, and in the latter half of 1987 did analysis and absorption of various similar foreign products together with the Huazhong College of Engineering, and also did a multi-plan feasibility study of the facts concerning the development of the domestic computer industry. At the same time as they were assimilating advanced foreign technology, they were boldly innovative and did development of their own, mastering

a succession of such key technologies as high-speed voice coil motors, full-tract closed-loop servo precision positioning systems, very dense read/write heads and dielectrics. They also applied these advanced international level technologies to the design and development of new products, only taking somewhat more than a year to successfully develop China's first group of JN1050 5.25-inch Winchester drives, with more than 60 percent of components produced in China, and they have begun to carry out small batch production for the domestic market.

Comparing this product with previous Chinese Winchester drives, we find that its performance, level of technology, and degree of difficulty are all improved by an order of magnitude. Average access time is 28 ms, average time between failures is 20,000 hours, and it is widely suitable for use in different kinds of micro- and minicomputer systems. It is not only small in size, with high capacity, but during conditions of heat expansion, mechanical abrasion, and external oscillation it also has superior reliability when compared with similar foreign products. Its appearance in China fills a void in the domestic computer industry.

Electronic Engineering CAD System Announced

40080221a Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 25, 28 Jun 89 p 1

[Article by Pan Ping [3382 1627]: "A General-Purpose High-Performance Electronic Engineering CAD System Developed in China Is Now Being Made Available"]

[Text] After the Computer Department of Zhejiang University had developed version 2.0 of their general-purpose integrated high-performance electronic engineering CAD system, and after application testing by users all over the country, they revised the product in light of this feedback information to eliminate some latent problems. They are now providing version 3.0 to the electronics world, which version has complete functions and excellent performance. It is appropriate for the needs of design and manufacture of television sets, radio-recorders, computers, electronic instruments, radio post and telecommunications, and equipment of various types.

This system was written in about 130,000 lines of code, comprising 38 program execution modules. It is compatible with the IBM PC/XT, AT286, AT386, the Chinese-produced Changcheng [Great Wall] series, the Zhonghua 286 and 386, and compatibles; with CGA, EGA, VGA, GW, and 1024X1024 high-resolution color display cards; with digital instruments and dot-matrix printers of all kinds; and with the HI-DMP series and the HP series (A1-A0) of plotters. Comparing this system to current software imported from abroad, we find that its outstanding characteristics include its size, completeness, and high quality, and that it has many software functions required on high-performance workstations.

The size of the system: it is intended for design of large-scale jobs. It handles up to 1,000 logic devices, 900 components may be installed on a printed-circuit board, 4,000 lines may be used in a circuit, and there can be 4,000 holes, 1-8 layers, and 1,000 resident subroutine library graphic symbols.

The completeness of the system: three modes are offered to the user: completely automatic, semi-automatic, and manual interactive. With an engineering graphics database at its core, operations begin with power-supply theoretical graphics, include automatic selection of wire lists, gate allocation, logic partitioning, unpacking of logic diagrams, placement (interactive or automatic), and wiring (automatic/interactive). In a coordinated process of operations, from beginning to end it thoroughly implements relevant checking of design rules, data conventions, electrical networks, and manufacturing conventions. The design results are stored and managed as files. Entire sets of engineering blueprints can be output on a plotter or a printer: such things as logic power-supply theoretical graphics, obverse/reverse printed-character charts, welding diagrams, drilling-symbol charts, and even mechanical treatment graphs for perforated unwelded joints. It can also select data from design databases, and print out various reports and inventories (in Chinese or Western languages), as for example component purchasing checklists, component installation position checklists, and statistical checklists according to categories of component position numbers. In addition, after the design of power-supply theoretical graphs, it can also call circuit-analysis subroutines, where the user can configure circuit parameters directly on the screen looking at node circuit diagrams; the results and data are finally output through analytic simulation, or the corresponding simulation curve graphs can be displayed.

The high quality of the system: first, we mean that the design quality is high. It can automatically lay out 45-degree oblique lines, various networks, and more than 10 different line diameters may be selected. It provides 50 terminal pads, with round, oval, square, rectangular, and wave-crest solder shapes, which can also be cut into any other shape. There are drill holes of 50 different internal diameters, in round, square, rectangular, and oval shapes. With interactive layout of lines, lines can go at any angle, the smallest divided networks being 0.0625 (0.0635); at the same time more than 10 line diameters are provided for operations. Second, we mean that the graphic artwork output by the plotter for photographic use is quite good; large-area grounding copper pads are automatically drawn in arcs, terminal pads are automatically transferred to tadpole tails at intersections with lines, places where lines turn are automatically transferred in arcs, and a small clear dot is left in the center of terminal pads. These characteristics rival those of advanced foreign CAD systems.

Because the performance-to-cost ratio for this system is so good, it has been winning over more and more users. So far, the system has been disseminated to such areas as

Wuxi, Changzhou, Shanghai, Beijing, Hangzhou, and Wuhan. Pertinent users and experts have considered that since importing high-quality electronic engineering CAD systems software still requires US\$30-70,000, and since there is an ever greater need in China for integrated high-performance electronic engineering CAD systems, the dissemination and application of this system could bring clear economic and social results.

New 286 System Shown

40080221b Beijing JISUANJI SHIJIE [CHINA
COMPUTERWORLD] in Chinese No 28, 19 Jul 89 p 1

[Article by Tang Baoxing [3282 1405 5281]: "The Chinese Academy of Sciences' Computing Institute Company Promotes the Quantum 286 Computer"]

[Text] At the recent Beijing International Exhibition, the company of the Computing Institute of the Chinese Academy of Science exhibited for the first time in China its Quantum System 286 that had been developed this year and which has attracted much attention from the public.

The Quantum 286 computer is a new model with an outstanding performance-to-cost ratio; the computer has been successfully developed by technicians of this company using the favorable conditions available in such areas as Hong Kong. This machine was already exhibited this year at the CeBit Exhibition in Hannover, West Germany, and at the American COMDEX Spring Show in Chicago, where it was well received; many customers placed orders.

The computer is a small-sized AT-compatible system, and is based upon a 12-MHz, 0-wait-state 80286 microprocessor. Basic RAM on the motherboard consists of 1 megabyte in single in-line memory modules (SIMM), which can be expanded to 4 megabytes. The motherboard also includes a floppy-disk controller and multiple I/O ports. There are 7 expansion slots on the motherboard, into which may be inserted various XT- or AT-compatible expansion cards. The system uses the TI [Texas Instruments] Company's AT-compatible chip set (3 chips) and Award BIOS chips.

Experts have judged that the performance-to-cost ratio of the Quantum 286 is better than that of several foreign products currently in use in China. In the international marketplace, the basic configuration of the Quantum 286 sells for US\$750 (including 1 megabyte of RAM and a 1.2-megabyte floppy drive, without hard disk). The computer is not currently available in China. According to the company, as capacity increases for supplying the product, it will be sold in China, too.

Also at the exhibition, this company showed a new FAX card, an associative Chinese-character card, and a programmable controller.

Domestic Production of Floppy Disks

Quality Meets International Standards

40080228 Beijing JISUANJI SHIJIE [CHINA
COMPUTERWORLD] in Chinese No 29, 26 Jul 89 p 1

[Article by Huang Xuchen [7806 2485 2525]: "Results Are Published for the First Nationwide Concentrated Testing and Evaluation of Floppy Disk Quality"]

[Text] The First National Conference for Review, Exchange, and Awards Concerning Concentrated Testing of Floppy-Disk Quality was held 26-28 June 1989 in Shenzhen. After diligent, overall, objective, and fair evaluation of the floppy disks being tested, 7 brands of floppy disks from 6 production plants met the requirements during this concentrated testing and evaluation of quality, for which they were awarded prizes for outstanding achievement. They were: the 3M-TM Xiezhen Brand (for domestic sale) from the Zhengzhou Transistor Plant, Xidex-TH Brand (for domestic sale) from the Shanxi Radio Plant No. 2, Micdat Brand (for domestic sale) and Prisma Brand (for foreign sale) from the Shenzhen Huayuan Electromagnetics Company Ltd., the HXC Brand (for domestic sale) from the Shanghai Huxing Electronics Company Ltd., the Haili Brand (for foreign sale) from the Shenzhen Haiyang Computer Magnetic Disk Plant, and the Aihua Brand (for domestic sale) from the Shenzhen Aihua Floppy Disk Company (the award-winning units and plants just mentioned are not listed in order of their placing).

The occasion of this concentrated testing and evaluation activity for floppy-disk quality was organized by the leadership of the Office of Quality in the Ministry of Machine-Building and Electronics Industry (MMEI) on the basis of the 1988 All-China Floppy-Disk Quality Exhaustive Evaluations arranged by the Computer Professional Association Peripherals Specialty Committee, and in the spirit of Document No. 51 on quality (1988) as issued by MMEI. The specific evaluation effort was the responsibility of MMEI's Center for Quality Inspection of Floppy Disks and Computer Magnetic Tape.

At the evaluation session held at the end of May in Taiyuan, the evaluation group undertook a strict appraisal in accordance with pertinent provisions in the "Nationwide Management Methods for Comparing Quality of Electronics Products" and in three papers produced for the occasion of this concentrated testing: "Testing Methods," "Detailed Testing Rules," and "Standards for Evaluation Points"; and they were in strict accordance with the test points and requirements of the international standard ISO7487/1, as well as the data from testing samples of tested products. For this evaluation testing, they also added such test items missing from the international standard as abrasion performance, surface resistance, and jacket adhesion, and also added such matters as examining test reports and user opinions for management performance regarding product quality. Through full-scale testing and

examination using 53 performance criteria, it was proven that the quality of the bulk of domestically manufactured floppy disks is good. Among these products, the performance specifications of some 70 percent completely met international standards and the requirements of this occasion of concentrated testing, while some 20 percent experienced missing or erratic pulses in some tracks, and the quality of the remaining 10 percent was deficient.

The testing and evaluation activities of floppy disks on this occasion will have an inspirational effect and will generate a positive influence on strengthening the concept of quality for floppy-disk production plants, on stimulating increasing improvement of the performance and quality of domestically produced floppy disks, on strengthening the reputation of domestically produced floppy disks in both domestic and foreign markets, and on improving economic results.

Self-Sufficiency Claimed

40080228 Beijing JISUANJI SHIJIE [CHINA
COMPUTERWORLD] in Chinese No 29, 26 Jul 89 p 1

[Article by Huang Xuchen [7806 2485 2525]: "China Is Completely Self-Sufficient in Production of 5.25-Inch Floppy Disks"]

[Text] Results have now been published from the First National Conference for Review, Exchange, and Awards Concerning Concentrated Testing of Floppy-Disk Quality. Those results indicate that for the 5.25-inch, 360K-byte floppy disks produced in China, 70 percent achieve or surpass the standards for quality of similar foreign products. According to approximate statistics, there are currently some 300,000 microcomputers in China, and if we calculate on the basis of 100 floppy disks used each year, annual use would be about 30 million, where current domestic production using imported equipment has already reached 100 million. Therefore, whether domestic floppy disks are viewed regarding product quality or in terms of volume, in either category the demand for the domestic market is fully met.

At this review, exchange, and award conference, representatives fully confirmed this conclusion, and also engaged in a lively discussion of such problems as how to speed up the development of the domestic floppy-disk production industry, how to make full use of the production capacity of existing imported equipment, and how to avoid the waste of foreign currency funds. The conference delegates unanimously resolved that in the name of the conference, the following summons would be issued to the relevant governing bodies:

1. It is hoped that resolute, decisive measures will be taken to immediately stop the continued import of 5.25-inch 360K-byte floppy disks.
2. It is hoped that continued import of production lines for 5.25-inch 360K-byte floppy disks will be stopped.

Through a survey of production conditions, it has been discovered that there are currently at least 17 imported production lines for floppy disks and related procedures, with a designed production capacity of more than 100 million diskettes. A survey of conditions at 12 production facilities in Guangzhou, Shenzhen, and Zhuhai shows that designed production capacity has already reached 77.88 million diskettes, while only 32.68 million were produced in 1988; this constitutes an equipment utilization rate of only 42 percent. What is more, there is a clear trend in the international marketplace for 3.5-inch floppies to replace 5.25-inch disks. If, therefore, import of production lines for 5.25-inch floppy diskettes and related procedures is not further limited, this could lead to an extreme waste of manpower, material resources, and financial resources, bringing an inappropriate loss to the state.

3. Intensify the concept of quality, and perfect the means of quality verification.

Floppy-disk technology is progressing rapidly, moving at present toward large capacity, small size, and miniaturization. Although floppy-disk quality checking departments in China currently have quite complete means of verification for 48 TPI [tracks per inch], 360K-byte and 96 TPI, 720K-byte 5.25-inch disks, we still lack instruments for analyzing and checking the quality of high-density 1.2-megabyte disks and the 3.5-inch mini-floppies. The state should therefore provide support for these things as soon as possible to enable the effective monitoring of quality for these new types of floppy disks.

Weather Forecast Made Easier With UHF Doppler Profiling Radar

40100012 Beijing CHINA DAILY in English
29 Nov 89 p 5

[Article by Li Hong]

[Text] The Chi Bi Battle, the most magnificent fight recorded in the legendary story "Romances of the Three Kingdoms," has impressed many readers because Zhuge Liang, a character with great wisdom, burned thousands of his enemy's battle ships by "borrowing southeastern wind."

For a long time, the Chinese have dreamed of forecasting and making use of wind. The day has finally come, with the development of the UHF (Ultra High Frequency) Doppler Profiling Radar.

The new radar system, located in south Beijing's Daxing County, is one of the key research projects during China's Seventh Five-Year Plan. It was co-developed by the Atmospheric Research Institute under the Chinese Academy of Meteorological Science, the 23rd Research Institute under the Ministry of Aero-space, and the Beijing Institute of Radio Measurement.

"The successful development of the system implies that China's military technology can be diverted for civilian use and produce large economic and social results," said Wang Lihen, General Engineer of the Ministry of Aero-space.

The new system can be used to measure the vertical profiles of the horizontal wind in nearly all weather conditions.

A few days ago, it was investigated by a 15-member appraisal committee consisting of experts on meteorology and radar.

The new profiling radar is suitable for detecting and observing the atmosphere movement prior to strong wind, rainstorms and hailstorms. The system is expected to accumulate information on current turbulence and jetstream wind which lead to atmospheric changes.

The radar is not only a complex tool for forecasting weather, but also a modern apparatus to ensure the safety of aircraft.

In addition, the newly-developed radar can help in weather monitoring, atmospheric physical research, platform operations on continental shelves, meteorological observation at sea, environmental protection and strategic wind-monitoring.

The system was completed in two years. A year of trial experiments afterwards determined that the system works very well, an official from the State Meteorological Observatory said.

During the summer, the radar successfully forecast disastrous weather affecting Beijing, Tianjin and Hebei Province.

The radar fills China's gap in meteorological non-balloon detecting techniques and brings the country up to world advanced standards," the appraisal report says. It puts China second after the United States in possessing such a system, it added.

The wind profiling radar uses a narrow antenna beam pointing in various directions. At each specified height three radial wind vectors are measured by analyzing the Doppler Spectra. This is called "Doppler Method."

The UHF Doppler Profiling Radar is noted for its high accuracy, efficiency and high-speed data transmission.

The radar measures wind profiles and transmits the data to remote computer. Data transfer takes place automatically. It also allows the radar to be controlled and operated from a remote terminal. Data can be stored on disk or tape for special experiments. All typical radar functions are controlled by keyboard.

Radar operation and maintenance are convenient and only one operator is needed. Radar operation can be controlled either by local or remote computer.

The headquarters of the Beijing UHF Doppler Profiling Radar is in central Beijing, 27 kilometers away from the radar base.

According to the official from the State Meteorological Observatory, the radar system was a cooperative effort involving scientists from the Chinese Academy of Sciences and the Ministry of machinery and Electronic Industry. And 99 per cent of the components of the radar system were manufactured domestically.

The official said that the Chinese users of the radar system, such as the departments of meteorology, civil aviation, military establishments and aero-space, should have faith in the China-made radar system. Some experts suggested that utilization of home-made radar system be expanded and blind imports avoided.

Reports on Fourth National Fiber-Optic Communications Conference

Total Cable Laid, Pilot Projects

90CF0129 Shanghai JIEFANG RIBAO in Chinese
10 Oct 89 p 2

[Article by Cao Yuhe [2580 3768 0735]]

[Text] It was reported at the Fourth National Fiber-Optic Communications Conference in Shanghai that scientists and technical workers in fiber-optics research, production, and applications units in China, after hard work, have achieved a number of breakthroughs and elevated China's fiber-optic communications to a new level of sophistication.

Fiber-optic communications in China began in the early 1970's; today there are tens of manufacturers of fiber optics, optical cable, optical terminals and other accessories. Small-batch production is already taking place and a complete manufacturing system is basically formed. There are also recent breakthroughs in fiber-optic communications devices. Wuhan Institute of Posts and Telecommunications Science, Shanghai University of Science and Technology, and the Shanghai Communications Equipment Plant have independently developed fourth-generation [i.e., 140 Mbps] single-mode fiber-optic communications systems and began testing these systems that can carry 1,920 telephone calls on one pair of fibers. Chinese-made single-mode lasers and single-mode receivers are also being tested on the system.

Three years ago China had 1,000 kilometers of optical cables; now it has more than 5,000 kilometers. Seventy percent of the fiber-optic lines use single-mode fibers, and the longest line, running 2,400 kilometers from Nanjing to Chongqing, will be completed next year. The longest line using Chinese-made optical fibers is the 252-kilometer line already in operation between Hanyang and Jingzhou.

There are 15 pilot projects in eight priority areas, including long-distance trunk lines, municipal telephone relays, railroad communications, television broadcasting, electric-power communications, industrial monitoring, defense monitoring, public safety and transportation monitoring. Most of these projects have been completed with good results.

The development of fiber optics in China has progressed from the ordinary to the more advanced. Underwater cables developed jointly by the Ministry of Post and Telecommunications' No 5 Institute at Chengdu and by the Shanghai Cable Plant will be installed under the water of the Yangtze River for several kilometers from Wuhu to Hefei. Composite electric-power-use optical cables developed by the Shanghai Cable Plant and the Shanghai Cable Institute are also being tested. Newest technologies on the international scene such as fiber-optic sensors, coherent optical communications and

wave-division multiplexing are also being developed and some preliminary results have been obtained.

Increased Production Over Next 2 Years

90CF0129 Shanghai WEN HUI BAO in Chinese
10 Oct 89 p 1

[Text] It was learned at the Fourth National Fiber-Optic Communications Conference which opened yesterday that although China's fiber-optic communications technology still lags behind some advanced countries, it is not far behind them. Among the high-tech areas, China's fiber-optic communications technology is the closest to that in other advanced countries.

Mass production has begun for fourth-generation fiber-optic systems that can carry 1,920 telephone calls on one fiber. Chinese fiber optics now meets international standards and 11,000 kilometers of fiber-optic cables have been installed or planned in China. Optical communications terminals and complete systems of DS4 [140 Mbps] equipment and optical components have been developed; advanced single-mode lasers and single-mode receivers have also been developed. Xian and Wuhan have respectively teamed up with Japan and Holland to produce 70,000 kilometers of optical fibers and production is scheduled to begin in 1990. The fiber-optic terminal equipment produced jointly by Shanghai and the AT&T Company of the United States is of top quality. China is capable of producing dynamic single-longitudinal-mode lasers and long-wavelength avalanche photodiodes that can be produced in only a few countries in the world. In order to promote the development of fiber-optic communications, responsible departments have implemented 15 pilot projects in eight priority areas, including long-distance trunk lines, municipal telephone relays, television broadcasting, industrial monitoring, and defense monitoring. Most of the projects have been completed with good results.

By 1990, China will have a new fiber-optic communications industry. The three production bases at Shanghai, Tianjin and Wuhan will have an annual capability of 100,000 kilometers of fiber and 10,000 kilometers of cable.

Shanghai now leads China in the research, production and application of optical fibers, optical cables, fiber-optic communications equipment and devices. The development plans call for establishment by 1991 of an optical-communications production group consisting of research institutes, universities, engineering application companies, domestic and foreign joint ventures, and plants; the output value of this group is expected [by 1991] to be 150 million yuan.

Analyses of Full Three-Dimensional S_1 - S_2 Iterative Solution in CAS Transonic Compressor Rotor, Comparison with Quasi-Three-Dimensional S_1 - S_2 Iterative Solution, L2F Measurement

40090080a Beijing GONGCHENG REWULI XUEBAO
[JOURNAL OF ENGINEERING THERMOPHYSICS]
in Chinese Vol 10 No 3, Aug 89 pp 255-261

[English abstract of article by Qin Lisen [4440 4539 2773], Zhao Xiaolu [6392 2556 6424] et al., of the Institute of Engineering Thermophysics, Chinese Academy of Sciences]

[Text] The full three-dimensional S_1 - S_2 iterative solution in the CAS transonic compressor rotor ⁽¹⁾ has been analyzed in detail by describing the variations of the flow parameters on the S_1 and S_2 surfaces and on the quasi-normal plane P_3 and the structure of the spatial shock. A comparison of the full three-dimensional solution with the quasi-three-dimensional solution and the L2F measurement shows that the results of the two iterative calculations are close to each other, but that the former has a stronger three-dimensional effect than the latter, and that they are in good agreement with the measurement. For medium transonic compressors, the quasi-three-dimensional calculation method can be used in the three-dimensional blade design and general analysis.

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Inverse, Hybrid Problem Research of Axial, Mixed, Centrifugal Turbomachine Along S_2 Surfaces with Velocity Distributions Given for Hub, Casing of Meridional Section

40090080b Beijing GONGCHENG REWULI XUEBAO
[JOURNAL OF ENGINEERING THERMOPHYSICS]
in Chinese Vol 10 No 3, Aug 89 pp 262-264

[English abstract of article by Zhu Genxing [2612 2704 5281], Ge Manchu [5514 3341 0443] et al., of the Institute of Engineering Thermophysics, Chinese Academy of Sciences]

[Text] On the basis of Wu's general theory of three-dimensional flow, a geometrical boundary solution for the meridional section is provided. In this paper, the flow characteristics of the mixed and centrifugal turbomachine along the S_2 surface, hub and casing coordinates can be calculated using the metric coefficients obtained by the given velocity distributions. This method is simple and the calculating convergence is good. The computer program is compiled for S_2 surfaces and can be used for solving inverse and hybrid problems. Several examples are calculated. It is demonstrated that this method is successful.

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Calculating Approximately Constant Reaction Turbine Stage with Tension Spline Streamline Curvature Method

40090080c Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 10 No 3, Aug 89 pp 280-283

[English abstract of article by Cui Jiya [1508 3444 0068], Lin Pingji [2651 1627 1015] et al., of Beijing University of Aeronautics and Astronautics]

[Text] This paper reports the first use of tension splines for the streamline curvature method to calculate an approximately constant reaction turbine stage. The proper use of the hub and shroud profiles, nozzle vanes' exit swirl distribution and their lean angles can be obtained by trial and error. Significant features of the constant reaction are shown for reference in design and research, but require experimental verification.

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Resonant Radiation of Atom in Squeezed Light Field

40090079a Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 7, Jul 89 pp 1041-1047

[English abstract of article by Zhang Weiping [1728 5898 1627] and Tan Weihang [6223 4850 5060] of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] In this paper, applying stochastic statistical methods, the authors obtain the resonant radiation spectrum of a two-level atom ensemble driven by multimode squeezed light. Corresponding to different squeezing degrees of the quantum fluctuations of the driving field, the central peak of the radiation spectrum exhibits subnatural- and supernatural-linewidth phenomena and, in all cases, the side peaks are broadened. The positions of the side peaks and the characteristics of symmetry of the radiation spectrum depend upon the coherent excitation direction and the squeezing direction of the driving field.

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Experimental Study of Rydberg States of Au Atom

40090079b Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 7, Jul 89 pp 1048-1055

[English abstract of article by Ding Gangjian [0002 0474 0256], Shang Rencheng [1424 0088 2052] et al., of the Department of Modern Applied Physics, Qinghua University]

[Text] A beam of gold atoms was produced by heating the gold-containing material using an electrothermal method. Two UV laser beams then orthogonally irradiated the atomic beam, exciting the Au atoms to very high Rydberg states from their ground states ($6S_{1/2}$). A high voltage pulsed electric field was applied to the interaction region approximately 200 ns after the laser pulse, ionizing the Au atoms into Rydberg states. By scanning

the wavelength of the laser within a certain range, the positions of 38 energy levels of Au atoms in the $n^2D_{3/2}$ ($n = 18-38$) and $n^2S_{1/2}$ ($n = 21-34; 36-38$) series have been determined. The ionization limits of the $n^2D_{3/2}$ and $n^2S_{1/2}$ series were found to be $E_D = 74409.8 (3) \text{ cm}^{-1}$ and $E_S = 74410.0 (2) \text{ cm}^{-1}$, respectively, by parametric fitting. The quantum effects of all these levels were also calculated.

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Photoluminescence Studies in $\text{In}_x\text{Ga}_{1-x}\text{As-GaAs}$ Strained Quantum Well Structure Under Hydrostatic Pressure

40090079c Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 7, Jul 89 pp 1086-1092

[English abstract of article by Wang Lijun [3769 5461 0689], Hou Hongqi [0186 1347 0796] et al., of the Institute of Physics, Chinese Academy of Sciences]

[Text] In this article, the authors report the results of photoluminescence studies of $\text{In}_{0.25}\text{Ga}_{0.75}\text{As-GaAs}$ strained quantum wells grown by molecular beam epitaxy under pressure at 77K. The applied hydrostatic pressure ranged from 0 to 50 kbar. The pressure coefficients of the Γ valley of the $(\text{InGa})\text{As-GaAs}$ strained quantum wells are presented. The authors have observed a crossover between the energy level in the well and the X valley in the barrier GaAs. With the analysis of its behavior under pressure, the ratio of conduction band offset to valence band offset in the $\text{In}_{0.25}\text{Ga}_{0.75}\text{As-GaAs}$ is determined to be $Q_c = \Delta E_c : \Delta E_v = 0.68:0.32$. The theoretical studies of $(\text{InGa})\text{As-GaAs}$ strained wells under normal pressure fit the experimental results very well. Some discussions involving $(\text{AlGa})\text{As-GaAs}$ quantum wells are also included in this paper.

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Single Band-Double Valley Theory for Superlattice, Quantum Well

40090079d Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 7, Jul 89 pp 1103-1110

[English abstract of article by Xue Fangshi [5641 5302 2514] of Nanjing Institute of Electronic Devices Research]

[Text] In this paper, an analytical energy band which can easily calculate GaAs, AlAs and AlGaAs is proposed. The transfer eigenvalue and energy effective mass are obtained by using the LCAO transfer matrix model. By studying the transfer eigenfunction for two energy valleys, the transformation between different energy valleys is derived, suggesting new concepts involving the symmetry transformer and symmetry filter. Using the energy effective masses and the transformation coefficients between energy valleys at the interface, the authors derive the equations for the envelope function and the boundary conditions for this single band-double valley model. Applying this theory to the GaAs/AlGaAs/AlAs

system, the confined energy level and wave function are calculated. Finally, the significance of this generalized effective mass theory is discussed.

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Ion Range Distribution in Multilayer Materials

40090079e Beijing *WULI XUEBAO [ACTA PHYSICA SINICA]* in Chinese Vol 38 No 7, Jul 89 pp 1111-1121

[English abstract of article by Xia Yueyuan [1115 2480 3293], Xu Xiangang [1776 3807 0474] et al., of the Department of Physics, Shandong University, Jinan; Yang Hong [2799 3163], et al., of the Department of Computer Science, Shandong University, Jinan]

[Text] In this paper, the authors present a new method for calculating depth profiles of implanted ions in multilayer materials. It combines the Monte Carlo simulation method with the method of numerical solution of the LSS transport equation. After taking into account the reflection of the ions at the interfaces of the layers, the analytical expression of the range distribution in the multilayer materials is obtained. A comparison between the theoretical and the experimental results is made, and good agreement is demonstrated.

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Two-Photon Transitions in Atomic Inner-Shells for Xe—Relativistic Effect, Atomic Screening Effect

40090002a Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 9, Sep 89 pp 1406-1412

[English abstract of article by Tong Xiaomin [0104 2556 3046] and Li Jiaming [2621 1367 2494] of the Institute of Physics, Chinese Academy of Sciences]

[Text] There has been recent interest in atomic inner-shell two-photon decay processes because state-of-the-art experimental techniques (such as electronic coincident measurement, etc.) have made it possible to measure the two-photon decay rate in the X-ray region. The authors have performed relativistic self-consistent field calculations on the two-photon decay rates of $(ls)^{-1} \rightarrow (ns)^{-1}$ transitions ($n = 2, 3, 4$) and $(ls)^{-1} (nd)^{-1}$ transitions ($n = 3, 4$) for hydrogen, the hydrogen-like Xe ion and Xe atoms. Comparing the hydrogenic and the hydrogen-like Xe ion rates, the relativistic effect can be clearly demonstrated. Comparing their previous non-relativistic and current relativistic Xe atom rates, the authors also demonstrate the relativistic effect in the atomic inner-shell two-photon decay. Comparing the hydrogen-like Xe ion and the Xe atom rates, the atomic screening effect can be explained. After elucidating the relativistic effect and the atomic screening effect, the authors are convinced that they have obtained reliable relativistic rates which can provide a basis for analyzing the effects of electron correlations in the atomic inner-shell two-photon decay. The results are compared with the experimental measurements and other theoretical results.

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Crystallography, Magnetic Properties of $YTi(Fe_{1-x}Ni_x)_{11}$

40090002b Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 9, Sep 89 pp 1429-1435

[English abstract of article by Yang Yingchang [2799 2019 2490] and Sun Hong [1327 1738] of the Department of Physics, Beijing University; Cheng Benpei [4453 2609 1014] of the Institute of Solid State Physics, Chinese Academy of Sciences, Hejei]

[Text] The compounds $YTi(Fe_{1-x}Ni_x)_{11}$ are found to crystallize in the $ThMn_{12}$ -type tetragonal structure (space group $I4/mmm$) when $x [h] 0.7$. The substitution effects of Fe by Ni on the saturation moment, magnetocrystalline anisotropy and Curie temperature have been investigated. Based on these substitution effects, the magnetic behavior of the Fe and Ni atoms in rare earth compounds is discussed. For the Fe compounds, the magnetic properties are mainly determined by the Fe-Fe interatomic distances and the number of Fe nearest neighbors, whereas for the Ni compounds, the magnetic properties are determined by the conduction electron transfer from the rare earth atom to the third band of Ni. In order to confirm the different behavior between the Fe and Ni compounds, the anomalous thermal expansion of $YTi(Fe_{1-x}Ni_x)_{11}$ has been studied and explained in terms of the interatomic distance dependence of the exchange interaction between Fe atoms.

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Semiclassical Theory of Negative Feedback Semiconductor Laser

40090002c Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 9, Sep 89 pp 1436-1442

[English abstract of article by Zhang Jianping [1728 1696 1627], Li Ling [2621 3781] et al., of the Department of Radio, Beijing University of Posts and Telecommunications]

[Text] In this paper, a semiclassical rate equation model has been established and the FM noise power spectrum calculated. The authors show that the spectral linewidth can be narrowed by the negative electrical feedback technique. Within the feedback loop bandwidth, the chirp-power-ratio (CPR) is reduced by a factor of $1 + H$, demonstrating that this kind of laser can be used as the light source in FSK coherent transmission systems. Because of the direct modulation phase delay of the semiconductor laser, $1/f$ -type FM noise is an important source of limitations to linewidth reduction.

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Theory of Swelling Due to Void Growth in Irradiated Materials. I. Neutral Sinks

40090002d Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 9, Sep 89 pp 1443-1453

[English abstract of article by Zhu Huilong [2612 1979 3891] of the Institute of Low Energy Nuclear Physics, Beijing Normal University]

[Text] The point defect concentrations around voids and dislocations in irradiated materials have been studied using reaction-diffusion equations. The equations containing terms involving the recombination of vacancies and interstitials have been solved approximately. It was concluded that the effects of the recombination on the sink strengths cannot be neglected when the damage dose rate and void size become large. The authors determined that when the void radius is greater than 200 Å and the damage dose rate reaches 10^{-2} dPa/s, the values of the void sink and dislocation sink strengths exceed those given in previous works by more than 50 percent.

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Theory of Swelling Due to Void Growth in Irradiated Materials. II. Bias Factor, Swelling Formula

40090002e Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 9, Sep 89 pp 1454-1466

[English abstract of article by Zhu Huilong [2612 1979 3891] of the Institute of Low Energy Nuclear Physics, Beijing Normal University]

[Text] Approximate concentration distributions of point defects around a dislocation in irradiated material are obtained by dividing the region near the dislocation into two parts in which some definite approximations are used. Then, the dislocation bias factor for interstitials is determined, with the value of the factor being less than the previous one by 20-50 percent. As a result, a formula for swelling due to void growth in irradiated materials is obtained, and it agrees reasonably well with the experimental data.

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Elastic Properties of Dislocation in Two-Phase Medium

40090002f Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 9, Sep 89 pp 1483-1491

[English abstract of article by Yang Shunhua [2799 7311 5478], Hu Xiaofeng [5170 1420 6912] et al., of the Department of Materials Physics, Beijing University of Science and Technology]

[Text] The authors propose an ideal configuration of a dislocation obliquely intersecting the phase boundary in a two-phase medium. By employing the general integral method of the anisotropic elastic theory of dislocations and the GIBBIA-ESHELBY theorem for boundaries, the numerical solutions for the elastic field of this dislocation, as well as the "image" force acting on it, are obtained. The model and computing method are shown to be generally applicable. The results can be used to further calculate the interaction between this dislocation and other defects. This work is also a meaningful starting point for studying the effects of such oblique dislocations in diffusionless phase transformations.

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