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13. ABSTRACT (*Maximum 200 words*)

The molecular beam epitaxy (MBE) system is being prepared for the preparation of manganese arsenide/gallium arsenide (MnAs/GaAs) composite films. The chamber has been evaluated for quality of the vacuum: A pressure in the 10^{-8} Torr range was obtained within hours without bakeout. The bakeable all metal valve connected to the turbo pump was found to leak through the valve seating when the valve was closed. Repairs are being made on the chamber and on the Boostivac ion pump controller.

Drawings have been prepared for the effusion cells in the molecular beam source. Professor Tamargo has agreed to provide access to her commercial MBE system to produce large are MnAs/GaAs samples. The effusion cells are available for deposition and it will be possible to exactly reproduce the deposition conditions of Rothberg and Harbison's work that was cited in the SBIR proposal. SKION will utilize AES, RHEED and LEED to provide in situ analysis to establish optimal growth parameters.

14. SUBJECT TERMS
molecular beam epitaxy
gallium arsenide
manganese arsenide
in situ analysis

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Progress Report
Item No: 0001AA

Title of the Project:

Optimization of Properties of a New Material for Electronic and Magnetic Applications

Topic No.:	BMDO 97-014
Contract No.:	BMDO N00014-97-C-0209
Contract Starting Date:	May 14, 1997
Contract Ending Date:	December 14,1997
Contractor:	SKION Corporation 50 Harrison Street Hoboken, NJ 07030

Prepared By:
Drs. J. Olsen & S. Kim
Principal Investigator
SKION Corporation
Report Date: July 14, 1997

Following the proposed statement of work, we have spent the first month of our contract preparing the MBE system for deposition.

The Summary of the activities performed in the period from May 14 to July 14, 1997:

1. The molecular beam epitaxy (MBE) system at Stevens is being put in order for the preparation of manganese arsenide/gallium arsenide (MnAs/GaAs) composite films. The Stevens MBE system is a custom built, bakable ultrahigh vacuum R&D tool, equipped with a bakable Pfeiffer-Balzers turbo pump, a bank of Perkin Elmer ion pumps, and a titanium sublimation pump. The chamber is fitted for Auger electron spectrometry (AES), reflection high energy electron diffraction (RHEED), and low energy electron diffraction (LEED). The chamber has been evaluated for quality of the vacuum: A pressure in the 10^{-8} Torr range was obtained within hours without bakeout. The bakeable all metal valve connected to the turbo pump was found to leak through the valve seating when the valve was closed—A replacement sealing pad and bonnet seals have been ordered. Repairs are also being made to a Boostivac ion pump controller. The system is fundamentally sound and ready for the installation of the effusion cells.

2. Drawings have been prepared for the effusion cells in the molecular beam source. Parts and materials suppliers have been investigated in terms of price and delivery time considerations. Parts and materials are being ordered.

3. Orders have been placed for various tools, parts, and supplies to be used in this project.

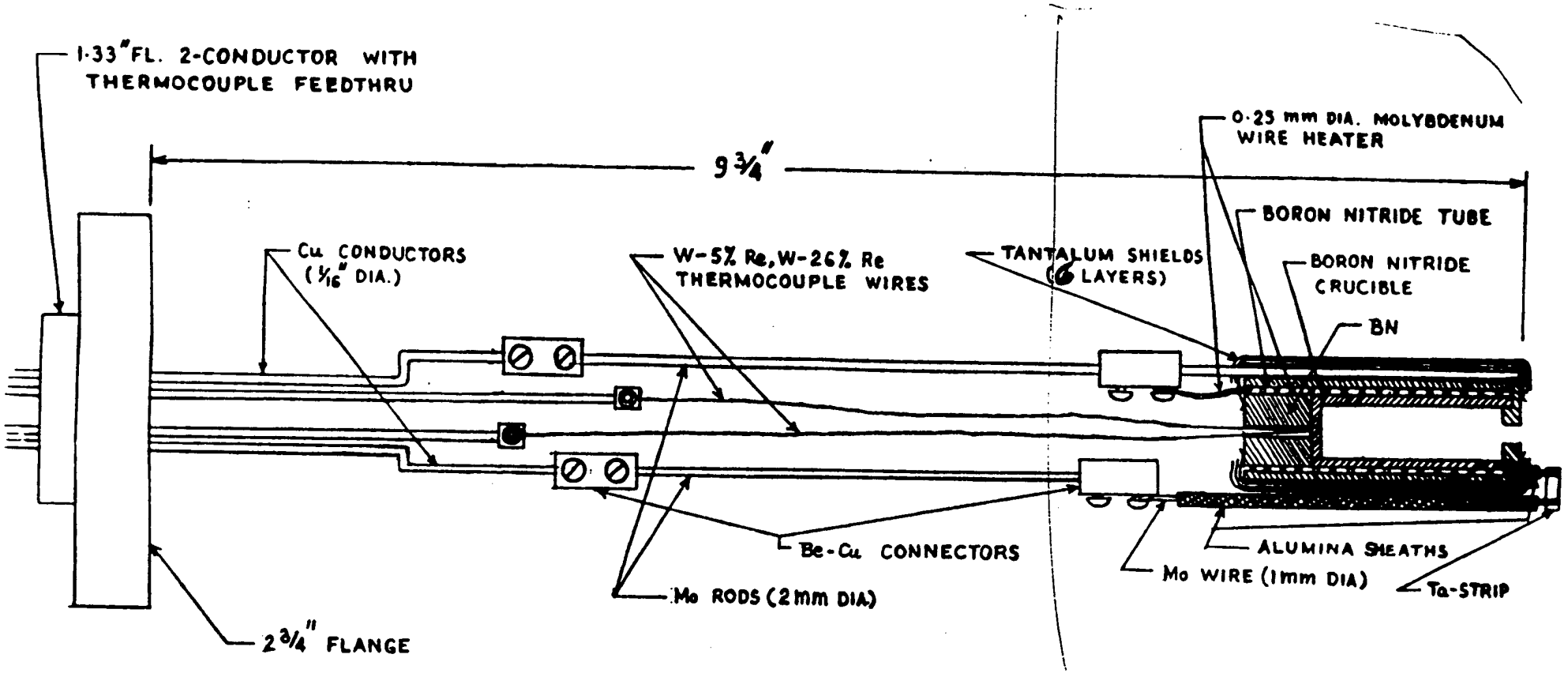
4. On April 30, Dr. Rothberg filed a patent application related to the effects of electric fields on these materials.

5. Professor Maria Tamargo at the City College of New York has agreed to provide access to her commercial MBE system to produce large area MnAs/GaAs samples. Professor Rothberg had collaborated with the previous owner of this MBE system (Bellcore) to carry out the pioneering work for this project. The effusion cells from the previous work are still in the machine and are available for deposition. This is an exciting development since it will be possible to reproduce exactly the deposition conditions of Prof. Rothberg's work with Bellcore that was cited in the SBIR proposal and in the patent application which was previously mentioned. By using this familiar MBE system, several weeks will be save in sample preparation. It will be possible, then, for SKION to take a more analytical approach with the Stevens MBE

growth and analysis system, utilizing its capabilities for Auger electron spectroscopy, x-ray photoelectron spectroscopy, and low energy electron diffraction to establish optimal growth parameters as well as x-ray diffraction and magnetooptic Kerr effect.

6. An abstract entitled "Electric Field Effects on Magnetic and Optical Properties of MnAs/GaAs (001) Thin Films" was submitted to the Seventh Joint Magnetism and Magnetic Materials - Intermag Conference to be held in San Francisco in January. The work forming the background for the present project will be reported.

MOLECULAR BEAM SOURCE



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STEVENS INSTITUTE OF TECHNOLOGY
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