

REPORT DOCUMENTATION PAGE

Form Approved
GSA No. 0704-0188

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1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE 06/18/99	3. REPORT TYPE AND DATES COVERED Final Technical Report	04/01/95 12/31/95
4. TITLE AND SUBTITLE A fundamental Investigation of Shock-Induced Reactions: The Role of Plastic Deformation and Synthesis of Ultra- Hard Materials			5. FUNDING NUMBERS DAAH04-95-1-0152	
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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) University of California, San Diego Applied Mechanics and Engineering Sciences 9500 Gilman Drive La Jolla, CA 92093-0411			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U. S. Army Research Office P. O. Box 12211 Research Triangle Park, NC 27709-2211			10. SPONSORING/MONITORING AGENCY REPORT NUMBER ARO	
11. SUPPLEMENTARY NOTES The view, opinions and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other documentation.				
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited.			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) This program supported the visit of Professor V. F. Nesterenko, Lavrentiev Institute of Hydrodynamics, Novosibirsk, Russia to UCSD, La Jolla, CA. Associated research focused on shock- and shear-initiated chemical reactions and the use of the thick- walled cylinder method for the generation of high shears at high strain rates. The program was successfully completed with the firm establishment of collaborative research and opening of new research areas.				
14. SUBJECT TERMS shock-induced chemical reactions			15. NUMBER OF PAGES 7	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION UNCLASSIFIED	19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED	20. LIMITATION OF ABSTRACT UL	

20010227 131

A FUNDAMENTAL INVESTIGATION OF SHOCK-INDUCED REACTIONS:
THE ROLE OF PLASTIC DEFORMATION AND SYNTHESIS
OF ULTRA HARD MATERIALS

FINAL TECHNICAL REPORT

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JUNE 23, 1999

U.S. ARMY RESEARCH OFFICE

GRANT NO. DAAH04-95-1-0152

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The research program was successfully completed and all objectives in the original proposal were accomplished. Dr. Nesterenko's stay at UCSD was extended and culminated with the offer for a position of Associate Professor in Residence, that he accepted. He was promoted to Full Professor (with tenure) in July 1998. The research program resulted in the publication of a considerable number of papers, that have already been submitted to the US Army Research Office. The following are the main accomplishments of the program:

1. It was demonstrated that intense plastic deformation occurring in shear localization can lead to exothermic chemical reactions in the Nb-Si and Ti-Si systems.
2. It was shown that shear localization can be observed in tantalum under extreme conditions of loading, which are experienced in the thick-walled tube geometry.
3. Damage evolution under dynamic deformation was investigated in alumina and silicon carbide. An in-depth analysis of ceramic comminution under impact conditions was carried out.
4. The self-organization of shear bands in titanium was demonstrated and quantified. This work was done in collaboration with Dr. T. W. Wright, U.S. Army research Laboratory.
5. Prof. Nesterenko is completing his book; it is expected to be published by Springer in 2001.

A list of papers published as a result of this research program and interactions after its conclusion is given below. The papers listed resulted from work in this program and subsequent work initiated during the visit of Prof. Nesterenko.

1. V.F. Nesterenko, M.A. Meyers, H.C. Chen, and J.C. LaSalvia, "Controlled High-Rate Localized Shear in Porous Reactive Media", Applied Physics Letters, December 12, 1994, vol. 65, (no. 24), p. 3069-3071. RESEARCH ARTICLE
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4. V.F. Nesterenko, "Dynamic Loading of Porous Materials: Potential and Restrictions for Novel Materials Applications", in Metallurgical and Materials Applications of Shock-Wave and High-Strain-Rate Phenomena Proceedings of the 1995 International Conference EXPLOMET-95, El Paso, August 6-10, Editors L.E. Murr, K.P. Staudhammer, and M.A. Meyers, Elsevier Science B.V., 1995, pp. 3-13. CONF PROCEED
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