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VERSATILE HIGH PERFORMANCE
HOLOGRAPHIC OPTICAL COATINGS

Progress Report 2

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1. INTRODUCTION AND EXECUTIVE SUMMARY

This report represents the second progress report (Item No. 0001AB) for SDIO contract number N00014-90-C-0145, "Versatile High Performance Holographic Optical Coatings." This is an SBIR program monitored by ONR.

When the last progress report was submitted, near the end of July, 1990, the basic concepts important for the development of versatile holographic optical coatings had been refined. Since then, we have concentrated on the following three tasks:

- Developing the equations needed to model the coating performance.
- Starting the development of the computer programs, based on the equations derived over the last two months, which will be used to predict and optimize coating performance.
- Research on detailed properties of holographic materials to be modeled (primarily DCG).

In addition, we decided to get an early start on writing the final report for this program. We have already written the first 65 pages of our final report. The completed portions of the report include background information, military and commercial applications of the versatile holographic coatings (HCs), and the mathematical model which describes coating performance.

The coating performance is being modeled using a generalization of the coupled mode or coupled wave theory, usually, used in the analysis of periodic structures. This approach had to be extended to the case of a coating which basically consists of a superposition of several chirped coatings. A first draft of our description of this theory is contained in section 3 of this progress report.

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2. FUTURE EFFORTS

The remaining work to be completed in this program, over the next couple months includes:

- Write and debug the computer program for modeling and optimizing the performance of the versatile HCs.
- Design baseline HCs and determine fabrication procedures.
- Write Phase I Final Report.
- Write Phase II Proposal.

The computer program is being written in Fortran for Macintosh PCs. Since a fair amount of number crunching is needed for each run, the code must be written to operate as efficiently as possible so that we can conveniently consider a large number of coating designs.

In addition, we currently plan to write and submit for publication in a scientific journal the results of our Phase I efforts. This paper will, if completed in time, be included as an appendix to our Phase II proposal.

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