REPORT DOCUMENTATION PAGE

AFRL-SR-BL-TR-98-

0291

1. AGENCY USE ONLY (Leave Blank)	2. REPORT DATE -01 Apr 1998	3. REPORT TYPE AND DATES COVERED Final prog. report, 01 Mar 1997 to 28 Feb 1998

4. TITLE AND SUBTITLE

DURIP97 Femtosecond vibrational spectroscopy of shock waves in materials

5. FUNDING NUMBERS

F49620-97-1-0151

2303 / ES 61102F

3484 / US 61103D

6. AUTHOR(S)

Dana D. Dlott

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

University of Illinois at Urbana Champaign

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

U. S. Air Force Office of Scientific Research
attn: Dr. Michael Berman
AFOSR/NI
110 Duncan Avenue Suite B115
Bolling AFB DC 20332-0001

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

97-NL-003

11. SUPPLEMENTARY NOTES

The views, 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 the documentation.

12 a. DISTRIBUTION / AVAILABILITY STATEMENT

Approved for public release; distribution unlimited.

12 b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

This grant provided partial funding for the acquisition of a powerful femtosecond laser. The laser is to be used in making femtosecond time resolved measurements of shock waves in molecular materials, with the eventual application being understanding the sensitivity to shock initiation of energetic materials. After suitable negotiations, a CPA-10 laser from Clark-MXR Corporation was selected and ordered. To save money, some parts and diagnostic equipment were ordered and shipped to Clark for inclusion in the finished system. The laser was delivered in Oct. 1997. In the last several months, warranty repairs and improvements were made on the laser and the experimental set up is being constructed.

14. SUBJECT TERMS

femtosecond spectroscopy, shock waves, energetic materials

19980414 133

NUMBER OF PAGES
2

PRICE CODE

17. SECURITY CLASSIFICATION OR REPORT	18. SECURITY CLASSIFICATION ON THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UL

Final report: DURIP97 Femtosecond vibrational spectroscopy of shock waves in materials

The DURIP program provided $156,401 for the purchase of a femtosecond laser and computer-controlled diagnostic equipment which would be used for shock wave studies. The University of Illinois provided matching funds of $30,000. The laser selected was the CPA-10 from Clark-MXR Corp., Dexter MI. This laser produces pulses short enough (150 fs) for femtosecond spectroscopy, and intense enough (10 mJ) to make good shock waves.

Because this is a laser system which required Clark to combine parts from some other laser companies, the U of Illinois purchased these parts and shipped them to Clark. These other purchases followed a print out provided by Clark, and were obtained from Thorlabs (optical mounts), Electro-Optics (Faraday rotator), and Newport Corp. (optical mounts). In addition a computer (Dell Corp.) and computer-controlled laser beam profiler (Spiricon) were purchased and shipped to Clark for integration into the system. Finally a pump laser (Surelite II-10) from Continuum Corp. was purchased and drop-shipped to Clark. To purchase the pump laser with limited funds, a deal was arranged where an older laser from Dlott's lab was used as a trade in.

Eventually all this equipment was ordered. In particular, the purchase order for the CPA-10 had to be approved by the Board of Trustees, and it was cut on April 10, 1997. About Oct. 1, 1997 the laser arrived. After a couple of weeks, it was set up by technicians from Clark. Then pow! It blew up a bunch of optics right away! The optics were replaced, and some time was spent tracking down the problem. Eventually the laser settled down, although it did blow up some more things over the course of a couple of months. Now we think we understand the source of the problem, and the laser is working reasonably well, although Clark is working on some improvements suggested by our experiences.

It turns out the problems with the laser are typical growing pains for this type of high power equipment, and they did not hurt our effort very much, because we were always able to keep the laser running at low power while it was being worked on. That has allowed us to work on setting up the experiment, and to gain familiarity with the system. However keep in mind it typically takes 12-18 months to get these things all set up and to start getting data from the system.

This grant provided funds for equipment only. No personnel were supported by the grant. No publications or inventions have resulted so far. Two postdocs, Joseph J. Cavaleri and Alexi Lagoutchev worked on this laser project, supervised by Prof. Dlott.

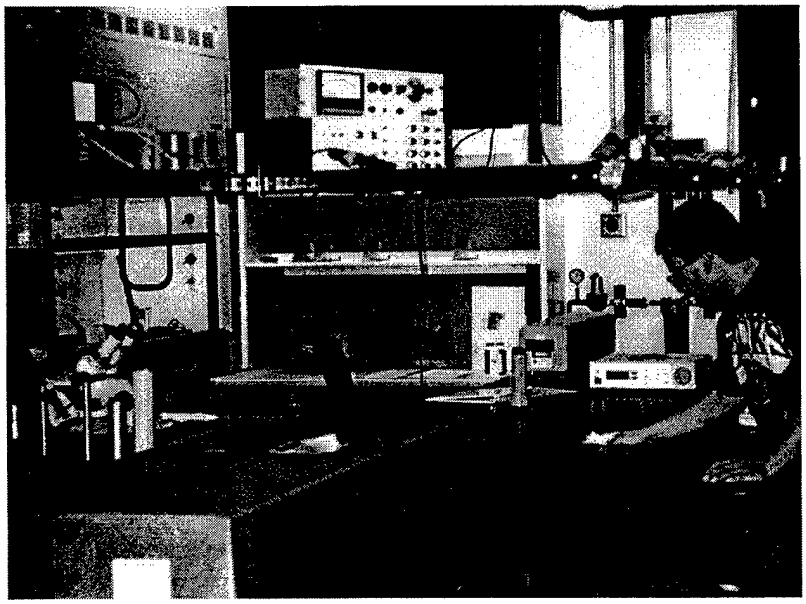

Figure 1. J. J. Cavaleri unpacking the new laser and installing it in Chemical and Life Sciences laboratory.