Final

2. REPORT TYPE

1. REPORT DATE (DD-MM-YYYY)

09/22/2004

3. DATES COVERED (From - To)

05/01/03 - 07/31/04

4. TITLE AND SUBTITLE

Zero electron kinetic energy/velocity map imaging (ZEKE/VMI) spectroscopy of negative ions

5a. CONTRACT NUMBER

F49620-03-D261

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

6. AUTHOR(S)

Daniel M. Neumark

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

University of California
Sponsored Projects Office
336 Sprout Hall
Berkeley, CA 94720

8. PERFORMING ORGANIZATION REPORT NUMBER

011988-005

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

AFOSR of Scientific Research
801 N. Randolph St., #732
Arlington, VA 22203-1977

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

F49620-03-D261 D3-1-0260

12. DISTRIBUTION / AVAILABILITY STATEMENT

Approved for public release/distribution is unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

Construction of the slow photoelectron velocity-map imaging (SEVI) instrument was completed and the first results were obtained, demonstrating the power of the technique in measuring high resolution (~0.5 meV) photodetachment spectra of negative ions. Work is continuing on improving the performance of this instrument, with particular focus on reducing stray magnetic fields in the detection region and modifying the ion source and mass spectrometer to achieve higher ion signal and stability.

15. SUBJECT TERMS

zero electron kinetic energy/velocity map imaging

16. SECURITY CLASSIFICATION OF:

a. REPORT

Unclassified

b. ABSTRACT

Unclassified
c. THIS PAGE

Unclassified

17. LIMITATION OF ABSTRACT

Unlimited (SAR)

18. NUMBER OF PAGES

3

19a. NAME OF RESPONSIBLE PERSON

Daniel M. Neumark

19b. TELEPHONE NUMBER (include area code)

(619) 942-3522

Standard Form 298 (Rev. 8-98)
Prescribed by AR 330-18

Feb 14 2003 5:52PM UC Berkeley
FINAL TECHNICAL REPORT

TITLE: Zero Electron Kinetic Energy/Velocity Map Imaging (ZEKE/VMI) Spectroscopy of Negative Ions

PRINCIPAL INVESTIGATOR: Daniel M. Neumark

DATE: 05/01/03 – 07/31/04

GRANT NO: F49620-03-0261 03-1-02-401

SENIOR RESEARCH PERSONNEL: none, other than Principal Investigator

JUNIOR RESEARCH PERSONNEL: Art Bragg, AnnElise Faulhaber, Michael Ferguson, Scott Goncher, Aster Kammrath, Katherine Kautzman, Jeong Hyun Kim, Giovanni Meloni, Matt Nee, Andreas Osterwalder, Darcy Peterka, Sean Sheehan, Niels Sveum, David Szpunar, Jan Verlet, Chia Wang, Jia Zhou

Abstract:

Construction of the slow photoelectron velocity-map imaging (SEVI) instrument was completed and the first results were obtained, demonstrating the power of the technique in measuring high resolution (~0.5 meV) photodetachment spectra of negative ions. Work is continuing on improving the performance of this instrument, with particular focus on reducing stray magnetic fields in the detection region and modifying the ion source and mass spectrometer to achieve higher ion signal and stability.

Final Technical Report:

The SEVI instrument was used to obtain high resolution photodetachment spectra of \( \Gamma \), \( \Gamma \) (CO\(_2\)), and Cl-D\(_2\). The SEVI spectra of \( \Gamma \) and \( \Gamma \) (CO\(_2\)) served as test systems, since these ions were studied earlier in our group using anion zero electron kinetic energy (ZEKE) spectroscopy. The SEVI spectra were of comparable resolution but data acquisition times were improved by about a factor of 100. The Cl-D\(_2\) SEVI spectrum showed partially resolved structure corresponding to a progression in the hindered rotor levels of the Cl-D\(_2\) van der Waals complex, a result of considerable interest in fundamental reaction dynamics owing to the importance of this complex in the Cl + D\(_2\) reaction. Preliminary results on the SEVI spectrum of the methoxide anion (CH\(_3\)O\(^-\)) show newly resolved structure owing to the interplay of spin-orbit and Jahn-Teller effects in the CH\(_3\)O radical that were not seen in conventional photoelectron spectra of this anion.

20050322 384
Publications


Interactions

Gordon Research Conference, Oxford University
Oxford, London
September 18-25, 2003

New Frontiers in Chemical Dynamics and Femtochemistry
The University of York, Department of Chemistry
Heslington York YO10 5DD
October 25 – 30, 2003
XIVth Symposium on Atomic, Cluster and Surface Physics
La Thuile
Aosta, Italy
January 2 – 6, 2004

227th ACS National Meeting
Anaheim, CA
March 28 – April 1, 2004

AFOSR Molecular Dynamics Contractors’ Meeting
New Port, Rhode Island
May 24 – 26, 2004

DICP Symposium on Molecular Dynamics
Dalian, Liaoning
P. R. China
July 21-23, 2004