AD-A193 689 LASER STUDIES OF GAS PHASE RADICAL REACTION(U) OXFORD UNIV (ENGLAND) PHYSICAL CHEMISTRY LAB G HANCOCK 30 NOV 85 DAJA45-85-C-0034 1/1

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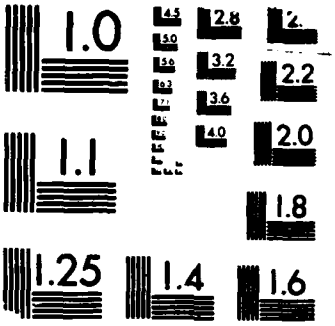

MICROCOPY RESOLUTION TEST CHART

(2)

Laser Studies of Gas Phase Radical Reaction

Principal Investigator : Dr. G. Hancock

Contractor : Oxford University,
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Contract Number : DAJA 45-85-C-0034

1st Periodic Report

1 October 1985 - 30 November 1985

"The Research reported in this document has been made possible through the support and sponsorship of the US Government through its European Research Office of the US Army. This report is intended only for the internal management use of the Contractor and the US Government."

Report

Two experimental investigations have been started during the first contract period, October and November 1985. The first of these involves laser induced fluorescence (LIF) of the CF radical in its ground $X^2\Pi_1$ state via the $A^2\Sigma^+ - X^2\Pi_1$ transition near 233 nm. A discharge flow system has been set up in a LIF cell, so that a microwave discharge of CF_4/Ar mixtures can be used to prepare the radical : laser output near 233 mm has been generated by Raman shifting the output of a pulsed Nd^{3+} - YAG pumped dye laser. Some

fluorescence has been seen : the experimental sensitivity is presently being improved, and computer simulation of the expected spectrum is being carried out.

The second investigation concerns the energy distribution in the products of the reaction

$$O + CHF \rightarrow CO + HF \qquad (1)$$

Vacuum uv emission from this system has been spectrally resolved, and shown to arise from $CO(A^1\Pi)$. Kinetic measurements show extremely complex behaviour which is not yet fully understood: $CO(A^1\Pi)$ is produced in at least a two step process:

$$O + CHF \rightarrow CO(1) + HF \qquad (2)$$

$$O + CO(1) \rightarrow CO(A^1\Pi) + O \qquad (3)$$

The identity of CO(1) has now been established as <u>not</u> the $a^3\Pi$ state, as quenching measurements with O_2 and N_2 show behaviour different to that expected for CO $a^3\Pi$. High vibrational levels of the CO ground state appear to be involved, and an apparatus to look at time resolved infrared emission from CO has now been constructed.

Research plans for the remainder of the contract period are the same as those set out in the proposal, namely

i) completion of the internal energy measurement in the O + CHF reaction, and further investigation into the N + CHF reaction.

ii) searching for CF LIF spectrum and study of reaction of this and the CCl radical with atoms.

iii) searching for FCO product of the O + CF_2 reaction.

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U.S. Army Contract DAJA45-85-C-0034

Important property acquired with contract funds during the period 1st October to 30th November 1985

IBM - Computer System

Plasma Technology - 2 Flowmeters

Electroplan - Data Board

Hercules Graphics Card

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Unused funds remaining on the above contract at 30th November 1985 amount to $69,111.00

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