Absolute Electron Scattering Cross Sections for the CF_2 Radical

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Contents

Summary

This thesis describes an experimental study of elastic electron scattering from CF_2 radicals, in the intermediate energy regime. Measurements of the absolute differential, integral and momentum transfer cross sections for CF_2 are presented. These measurements were performed using a new crossed beam spectrometer, incorporating a supersonic gas source and normalised using a new technique, with both of these features being extensively developed as a major part of this study.

The organisation of this thesis is as follows: A brief justification for this research is presented in Chapter 1, together with a review of the spectroscopy and electron collision cross sections which are currently available for the CF_2 radical. The crossed beamed apparatus and experimental techniques used to perform the present cross section measurements are then described in detail in Chapter 2, and the theory behind the new normalisation technique is subsequently presented in Chapter 3.

Results from the present study are given in Chapter 4. Firstly, differential cross sections measurements for stable molecules are presented, to validate the new normalisation method. Characterisation data for the dissociation dynamics of C_2F_4 into CF_2 radicals are then presented and, finally, differential cross section measurements for the CF_2 radical are explored. Where possible, the measured data for CF_2 are compared against results from theoretical calculations and the implications of the present results are discussed. The major findings of this research are then summarised in Chapter 5, and directions for future research using the present apparatus are also discussed here. Finally, some additional findings from this research and calibration data for the current apparatus are given in the appendices.

Declaration

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

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