

Valence shell studies for DMDS molecule by angle-resolved electron-energy-loss spectroscopy

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Sinopse. Electron impact spectra for dimethyldisulfide (DMDS, CH₃SSCH₃) have been obtained at scattering angles of 2°, 3°, 4°, 5° and 6° using 1 keV incident electrons. The measured intensities were converted to an absolute scale at each scattering angle. Absolute electron-impact differential cross sections for elastic scattering is shown over the range 2 degrees to 25 degrees.

The present work is part of a systematic study of the interaction of electron impact with samples like volatile organic compounds (VOCs) [1, 2, 3]. Dimethyldisulfide (DMDS, CH₃SSCH₃) is a VOC, highly volatile sulfur-containing molecule. Sulfur plays an important role in both the tropospheric and stratospheric budget of atmospheric gases. Investigation of the atmospheric sulfur cycle has been a subject of scientific interest [3, 4].

The vacuum ultra violet (VUV) absorption cross sections of DMDS molecule has been concentrated on valence-shell processes with photoabsorption spectrum, covering roughly of 4.0 up to 12.4 eV energy range [5].

Electron impact spectra for DMDS have been obtained at scattering angles of 2°, 3°, 4°, 5° and 6° using 1 keV incident electrons, to the valence excitation spectrum determined up to 100 eV energy range. These relative intensities of the generalized oscillator strength was measured using an intermediate energy, variable-angle, low-resolution electron energy loss (EEL) spectrometer [6].

The measured intensities were converted to generalized oscillator strengths and placed on an absolute scale at each scattering angle by the use of the S(-2) sum rule. The methodology in the determination of the optical oscillator strengths distribution from the electron energy

loss spectrum (EEL) has been previously described by reference [2]. Briefly, to convert the 2° EEL spectrum (4-100 eV) into relative differential generalized oscillator strength, each data point was extrapolated to the momentum transfer is negligible, according to the universal formula introduced by Msezane and Sakmar [apud Boechat-Roberty, 6].

In addition, in the present contribution, experimental results on elastic electron scattering will be shown. The experimental absolute electron-impact differential cross sections for elastic scattering is shown over the range 2 degrees to 25 degrees.

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