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Synopsis In the present study joint experimental and theoretical elastic differential cross sections for electron scattering from dichloromethane in the incident electron energy region 7 to 50 eV are discussed.

Dichloromethane (CH2Cl2) is a relevant atmospheric and environmental molecule, where its high volatility results from the constant use in chemical industries [1], in biomass production [2] as well as from oceanic emissions [3]. Once in the stratosphere, the main sink mechanism has been attributed to photolysis leading to chlorine radical formation. Such radical at tropospheric altitudes further acts as a catalyst to ozone fragmentation into ClO. Photolysis [4], photoabsorption [5] and DEA [6] studies can be found in the literature, but only a few related with electron scattering processes and even those are in the high energy regime [7] or strictly theoretical approaches [8, 9].

Here we present a comprehensive joint experimental and theoretical study on differential cross sections (DCSs) for elastic electron scattering from CH2Cl2 molecule for incident electron energies 7, 10, 20, 30 and 50 eV. The experimental DCSs were obtained in a High Resolution Electron Energy Loss Spectrometer (HREELS) [10] with an energy resolution of 120 meV (FWHM). The theoretical calculations were performed with two different methodologies: the Schwinger Multichannel Method (SMC) implemented with pseudopotentials [11] and the Independent Atom Method with Screening Corrected Additivity Rule (IAM-SCAR)[12]. The SMC method presents a better description of the elastic scattering at lower electron impact energies (up to 20 eV), where the Born Closure correction for long range potentials gives a good description of the dipolar cross section dependence for smaller scattering angles. The IAM-SCAR method shows a better description for electron impact energies above 20 eV.

The excellent agreement between experimental DCSs and both theoretical approaches leads to a good description of the shapes and angular distribution of the cross sections.

References

Figure 1. Elastic DCS for electron scattering from CH2Cl2 at 10 and 20 eV electron impact energy.