A THEORETICAL STUDY ON ELASTIC ELECTRON-CF$_2$ RADICAL COLLISIONS

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Electron-molecule collisions play an important role in a number of physical and chemical processes. In particular, interest on electron collisions with highly reactive radicals such as CH$_x$, CF$_x$, (x= 1,2,3), etc, has grown recently, in view of their important role in developing plasma devices. Specifically the CF$_x$ radicals are some of such important fragments. These radicals can be produced from dissociation of CF$_4$ either by collisional and/or photodissociation processes. Since CF$_4$ is frequently used as a reactant gas plasma etching processes in the semiconductor industries, the knowledge of several cross sections for e$^-$-CF$_x$ collisions is relevant. Unfortunately, experimental determination of such data is difficult. Therefore, theoretical calculations are presently an important manner to fill this lacuna. In this work we present a theoretical study on electron scattering by difluoro-methylene (CF$_2$) radical in the low energy range (1-30 eV). The present study made use of a optical potential, composed by static, exchange and correlation-polarization contributions, to represent the electron-radical interaction dynamics. The Iterative Schwinger variational method [1] is used to solve the scattering equations.

Fig. 1 shows our DCS's for elastic e^-–CF$_2$ collision calculated at incident energy of 3 eV. The recent theoretical DCS's for this radical [2], as well as calculated [3] and experimental ICS's [4] for electron scattering by O$_3$, which is an isoelectronic molecule of CF$_2$, are also shown for comparison. In general, there is a good agreement between the present calculated data and those of Rozum and Tennyson [2]. It is interesting to see that there is also a fairly good agreement between our results with the calculated DCS's for O$_3$, particularly at intermediate and large scattering angles. This fact may indicate the relavance of the intereaction between the scattering electron and the valence electrons

of the targets. The discrepancy seen at small angles is probably due to the different dipole moments of CF$_2$ and O$_3$. Additional results will be presented during the Symposium.
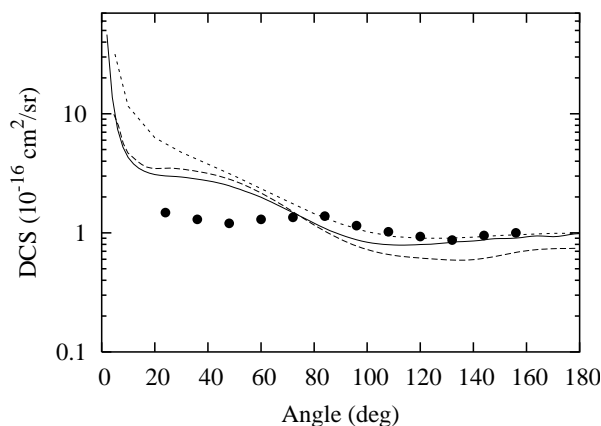
Fig. 1. DCS's for elastic electron scattering by CF$_2$ at 3 eV. Full curve, present results; dashed line, calculated results for e^-–CF$_2$ scattering of Rozum and Tennyson [2]; dotted line, the calculated results for e^-–O$_3$ scattering of Lee *et al.* [3]; full circles, experimental results for e^-–O$_3$ of Shyn and Sweeney *et al.* [4].

References
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