A THEORETICAL STUDY ON ELECTRON-METHYLENE (CH_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 methylene radical is one of such important fragments. This radical can be produced from dissociation of CH_4 either by collisional and/or photodissociation processes. Since CH_4 is frequently used as a constituent of feedgas in technological processing plasmas for deposition purposes (diamond films, diamond-like carbon films, amorphous carbon films), the knowledge of several cross sections for e^--radical 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 CH_2 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 calculated ICS's for elastic e^-–CH_2 collision, in the (1–30)-eV range. The calculated ICS's for e^-–CH scattering [2], as well as calculated [3] and experimental ICS's [4-6] for e^-–CH_4 are also shown for comparison. Qualitatively, a minimum located at incident energies around 1.2 eV is seen in our calculated ICS's for e^-–CH_2 collision. Eigenphase analysis has shown that it is not a Ramsauer-Townsend minimum. Additional results will be presented during the Symposium. This work was partially supported by the Brazilian agencies CNPq and FAPESP.

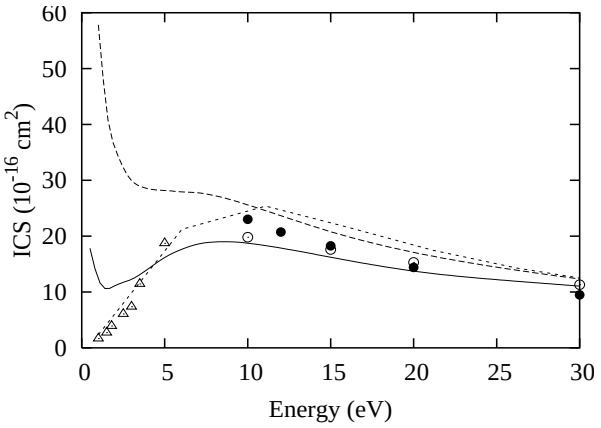

Fig. 1. ICS's for elastic electron scattering by CH_2 in the (1–30)-eV range. Full curve, present results; dashed line, calculated results for e^-–CH scattering of Lee *et al.* [2]; dotted line, the calculated results for e^-–CH_4 scattering of Machado *et al.* [3]. The shown experimental results for e^-–CH_4 are: full circles, Boesten and Tanaka *et al.* [4]; open circles, Shyn and Cravens [5]; open triangles, Sohn *et al.* [6].

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