Absorption effects in electron scattering by CH_3F

Jorge R. Ferraz[1], Antônio S. dos Santos[1], Luiz E. Machado[1]

[1]Departamento de Física, UFSCar, 13605-905, São Carlos, SP, Brazil
dlem@df.ufscar.br

Although still very frequent, the use of Carbon tetrafluoride (CF_4) in industrial processes has raised serious concerns related to the environmental protection. Methyl fluoride (CH_3F) has been pointed out as a possible substitute of CF_4, due to the significantly shorter lifetime of the former [1]. Cross sections for electron scattering by CH_3F are a useful tool in the modeling of plasmas that can possibly be used in that replacement.

In this work we report several calculated cross sections for e^--CH_3F scattering. In our calculation we solve numerically the Lippmann-Schwinger equation using a complex interaction potential that is comprised of the static, exchange, correlation-polarization and absorption parts. The static part is calculated directly from the Hartree-Fock SCF wavefunction of the target, the correlation-polarization and absorption parts are approximated by local model potentials from the literature [2,3], and the exchange part is calculated exactly, starting with a local model exchange potential [4] that is iteratively corrected by using the Padé approximant technique [5].

In Fig. 1 we show our differential cross sections (DCS) for elastic e^--CH_3F scattering at 100 eV, alongwith the experimental data of Tanaka et al. [1]. Additional results will be presented at the Conference.

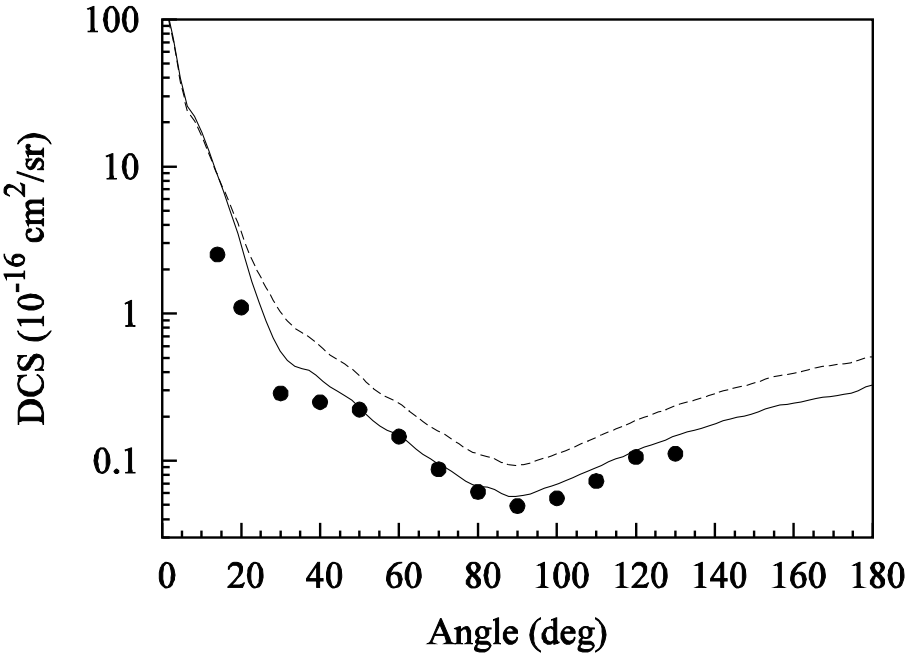

Fig. 1: DCS for elastic e^--CH_3F scattering at 100 eV. Solid line; present results including absorption effects; dashed line, present results not including absorption effects; full circles, experimental data of Tanaka et al. [1].

References

[1] H. Tanaka *et al.*, Phys. Rev. A Phys. Rev. A, **56** R3338 (1997); L. G. Christophorou, J. K. Olthoff, and M. V. V. S. Rao, J. Phys. Chem. Ref. Data **25**, 1341 (1996).
[2] N. T. Padial and D. W. Norcross, Phys. Rev. A **29**, 1742 (1984).
[3] M.-T. Lee *et al.,* J. Electron Spec. Rel. Phenom. **155**, 14 (2007).
[4] S. Hara, J. Phys. Soc. Jpn. **22**, 710 (1967).
[5] F. A. Gianturco, R. R. Lucchese, and N. Sanna, J. Chem. Phys. **102** 5743 (1995).