ELASTIC SCATTERING OF LOW-ENERGY ELECTRONS BY CF$_3$Cl, CF$_3$Br, AND CF$_3$I

M. H. F. Bettega*, A. P. P. Natalense†, M. A. P. Lima†, L. G. Ferreira†, T. Tanaka‡, H. Cho **, M. Kitajima‡, and H. Tanaka‡

*Departamento de Física, Universidade Federal do Paraná, Caixa Postal 19044, 81531-990 Curitiba, Paraná, Brazil
†Instituto de Física, UNICAMP, 13083-970, Campinas, São Paulo, Brazil
‡Department of Physics, Sophia University, Chyoicho 7-1, Chiyoda-ku, Tokyo 102-8854, Japan
**Department of Physics, Chungnam National University, Taejon 305-764, Korea

Electron collisions with CF$_3$X (X=Cl, Br, I) molecules have been subject of several studies[1, 2, 3]. Some of these studies deal with the negative ion formation by electron attachment. This type of process can lead to molecular dissociation through different paths, resulting in neutral and charged fragments. Low energy electron molecule cross sections can be very useful in modelling low temperature plasmas of these gases, where these processes are present. In this work, we present elastic integral, differential and momentum transfer cross sections for e$^-$–CF$_3$X (X=Cl, Br, I) collisions.

To compute the scattering cross sections we used the Schwinger multichannel method with pseudod potenti als (SMCPP)[4] at the static-exchange approximation. The cross sections for the entire family of molecules were obtained using a 6s5p2d Cartesian Gaussian basis for the carbon and halogen atoms. In general the permanent dipole moment of these molecules are well described with the present Cartesian Gaussian basis sets and their values are relatively small. As a result no completion of the scattering amplitude with first Born term was necessary, even at the higher energies. To illustrate, in figure 1, we compare calculations of elastic differential cross sections for CF$_3$Cl at 20, 30 and 60 eV obtained in Curitiba and Campinas with the experimental data obtained in Tokyo and Taejon. In general, we found very good agreement between theory and experiment. At the conference we will present a comparison among the cross sections of the family (emphasizing the halogenation effects [5, 3]) in the energy range from 10 up to 100 eV.

References