ELECTRON AND POSITRON SCATTERING FROM CF3I MOLECULES BELOW 600 eV

Mineo Kimura
Graduate School of Science and Engineering, Yamaguchi University, 755−8611 Ube, Japan

1 Extended Abstract

Perfluorocarbon (CmFn) molecules have been regarded as important and efficient gases for plasma etching over the years, and have been extensively used in semiconductor manufacturing industries in worldwide. However, because of their long life in stratosphere as well as in atmosphere and hence causing the harm to the earthUs climate, it has been decided to completely terminate the usage of these gases in very near future. Therefore, it has been urgently required for the etching researcher to develop an alternative new etching gas that is environmentally safe and efficient for the etching. Strong candidates for these alternative gases are non−perfluorocarbon gases such as CF3I because the C−I bond in the molecule is known to readily break releasing CF3 radicals. To assess the behavior of these molecules in the plasma environment, it is crucially important to understand the fundamental spectroscopic properties of these molecules and their dynamics, particularly, the electron scattering processes at low to intermediate energies. Furthermore, in order to gain the better understanding of interaction and dynamics, and the feature of resonance, a comparative study using electron and positron impact would be of great help.

Also a set of total cross−section data for a wide range of the collision energy is necessary to assess and evaluate the role of inelastic scattering processes. Therefore, we conduct a comparative study for electron and positron scattering from CF_3I molecules for total and elastic cross sections to provide the benchmark data, since no data for the molecule is available to the best of our knowledge.

Furthermore, we carry out a comparative study of total cross sections between CF_3I and CF_3H to contrast the effect of iodine atom in CF_3I for both electron and positron impacts, and hence dynamics. We have recently carried out an experimental measurement for differential elastic cross sections. Along with this study, our current study provide more detailed information of total and elastic cross sections for the molecule, and encourages further experimental and theoretical studies for individual inelastic processes for the complete understanding of physical and chemical properties of the molecule.