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New trends in low-energy electron collisions with molecules

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Experimental studies on electron-polyatomic molecular collisions are reviewed in connection with the plasma processing and environmental issues. Recent developments in electron scattering experiments on differential cross sections (DCSs) are summarized for various processes such as elastic scattering, vibrational, and electronic excitations, including the dissociative attachments as well as the radical formation. Three illustrative examples are described specifically as follows: 1) perfluorocarbons as the main feed gases in the plasma etching industry and the need to be replaced by alternative compounds that have low global warming potentials, e.g. COF_2 , C_3F_6 , and $l\text{-C}_4\text{F}_6$; 2) detection of non-emissive CH_3 radicals via the low-lying electronic states of CH_4 by electron impact; and 3) the electronic spectra of thymine by electron impact methods, also including H_2O . This work was supported by the Ministry of Education, Sport, Culture and Technology, the Japan Society for Promotion of Science, the Japan Atomic Energy Research Institute, and the CUP program between Japan and South Korea. In collaboration with Masamitsu Hoshino, Department of Physics, Sophia University, Chiyoda-ku, Japan; Casten Makochekanwa, Department of Physics, Sophia University, Chiyoda-ku, Japan, Graduate School of Sciences, Kyushu University, Japan; Hyuck Cho, Physics Department, Chungnam National University, South Korea.