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``Electron scattering on triatomic molecules: SO$_2$, OCS and N$_2$O''

1. INTRODUCTION

Accurate experimental data concerning electron-molecule scattering are of importance in understanding phenomena in the earth and other planets' atmospheres, interstellar matter, radiation chemistry, gaseous discharge plasma and/or electron impact-induced reactions on surfaces. However, in spite of the efforts, there remain remarkable, mysterious discrepancies between cross sections taken in different laboratories, even for simple molecules.

In our laboratory at the Technical University of Gdańsk we continue an experimental program which aims at the measurements of absolute total electron scattering cross sections on a range of molecular targets at low and intermediate energies. Special attention is paid to lowering of systematic errors related to the employed method.

The present work concerns the measurements of the absolute total cross section for electron scattered from $\text{SO}_2$, OCS and $\text{N}_2\text{O}$ molecules for impact energies varying between 0.5-250 eV, 10-250 eV and 0.5-250 eV, respectively.
2. EXPERIMENTAL

The experiment reported here was carried out with an electron spectrometer working in the transmission mode. The method is based on measurements of the rate of attenuation of the electron current passing through the target volume (see Fig. 1.).

The total cross section $Q(E)$ at a given energy $E$ was derived by measuring intensities of the incident $I_0$ and transmitted $I_p$ electron beams, and applying the Bouguer-de Beer-Lambert relationship

$$Q(E) = \frac{1}{nL} \ln \left[ \frac{I_0(E)}{I_p(E)} \right],$$

where $L$ is the length through which scattering processes take place. The number density $n$ of the target was determined from absolute measurements of the gas-target pressure and its temperature, taking into account the thermal transpiration effect.
The series of gas-target pressures $p$, the respective intensities $I_p$ and $I_0$ and target temperature $T$ were scanned and measured by high accuracy devices, and via interface stored in the memory of the PC computer. The apparatus and experimental procedure used in the present measurements have already been intensively employed for the determination of absolute total cross sections in our laboratory. More information concerning used experimental setup and the data-taking procedure can be found elsewhere (e.g. [1]).

3. RESULTS

The measured total cross sections for $e^-$-SO$_2$, $e^-$-OCS and $e^-$-N$_2$O are shown and compared with prior experimental data of other authors in Fig. 2, Fig. 3, and Fig. 4, respectively. The error bars correspond to overall experimental uncertainties estimated at selected points. Details will be presented at the Conference.
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