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Total cross section measurements for electron scattering from tin(IV) chloride (SnCl_4)

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Synopsis Total cross section for electron scattering from SnCl_4 molecules has been measured for energies from 0.6 to 300 eV. Obtained results have been compared with total cross sections for electron scattering from other tetrachloride molecules: XCl_4 where $\text{X}=\text{C}, \text{Si}, \text{Ge}$.

Precise experimental data concerning electron interactions with matter, including molecules in the gas phase, are very important for understanding and modelling many physical and technological processes. Tin tetrachloride is one of the simplest molecular compound which can be used as a precursor in nanostructure production with focused electron beam deposition (FEBID).

In the present experiment we have measured absolute total cross section (TCS) for low- and intermediate-energy electron scattering from SnCl_4 molecules. Measurements have been carried out with the electrostatic 127° electron spectrometer [1] working in the linear transmission mode for electron energies ranging from 0.6 to 300 eV. The TCS $\sigma(E)$ at given electron impact energy E has been obtained according to the attenuation formula:

$$I_n(E) = I_0(E) \exp[-nL\sigma(E)].$$

Here, $I_n(E)$ and $I_0(E)$ are the measured intensities of the electron beam passing the distance L through the reaction volume in the presence and absence of the target vapour, respectively; n is the number density of the target molecules in the scattering cell. Obtained TCS is shown in figure 1a for impinging electron energies ranging from 20 eV up to 300 eV. In figure 1b TCS for electron scattering from SnCl_4 molecules is compared with TCSs for CCl_4 [2], SiCl_4 [3] and GeCl_4 [4] molecules. All data have been taken with the same experimental method and the same apparatus. It is worth to note that the TCS value in the presented energy region is correlated with

the static electric polarizability of the target.

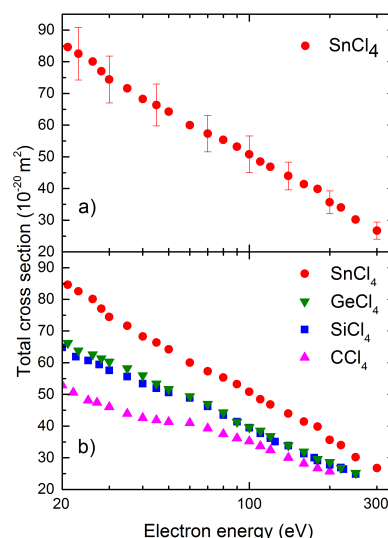


Figure 1. a) Present experimental total cross section (TCS) for the electron scattering from SnCl_4 and b) its comparison with TCSs for CCl_4 [2], SiCl_4 [3] and GeCl_4 [4] molecules. Error bars correspond to overall experimental uncertainties.

References

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