Backscattering coefficient of beryllium by Monte Carlo simulation

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Synopsis We present a Monte Carlo simulation of electron backscattering coefficient of beryllium at impact energy range between 100 eV and 10 keV. In our simulation both the elastic and inelastic scatterings of primary electrons and also the secondary electron production during the transportation process of the electrons inside the beryllium are taken into account. Our present results are compared with available previous data.

The accurate knowledge of the interaction of charged particles with surfaces bounding the plasma in the fusion reactor is extremely important. Beryllium is one of the key elements in the realization of the fusion power plant because it is a major candidate to use as the first wall material in fusion reactor. However, there are either very limited or only very old data available for prediction of the electron backscattering coefficient. Therefore, it is the time to perform new studies to derive more reliable data. On the other, in recent years theoretical modeling of electron-solid interaction has been advanced significantly. In this work, a systematic Monte Carlo simulation has been performed to investigate the backscattering coefficients of beryllium in the incident electron beam energy range of 0.1-10 keV.

Our Monte Carlo simulation model is based on Mott's cross-sections for electron elastic scattering as calculated by partial wave method and dielectric functional approach with the full Penn's algorithm [1] for electron inelastic scatterings. Cascade secondary electrons generated during the electron inelastic scatterings are also taken into account in our model [2]. For the determination of the dielectric function to calculate the inelastic cross sections, we used Palik's optical data for lower photon energies below hundred eV and Henke's data for higher photon energies. In this work we present accurate Monte Carlo simulations providing the electron backscattering coefficient of beryllium at impact energy between 100 eV and 10 keV. Our recent simulated results are compared with available experimental data (see Fig. 1). Moreover we will also show the angular dependence of the electron backscattering coefficient as a function of incident angle and incident energy.

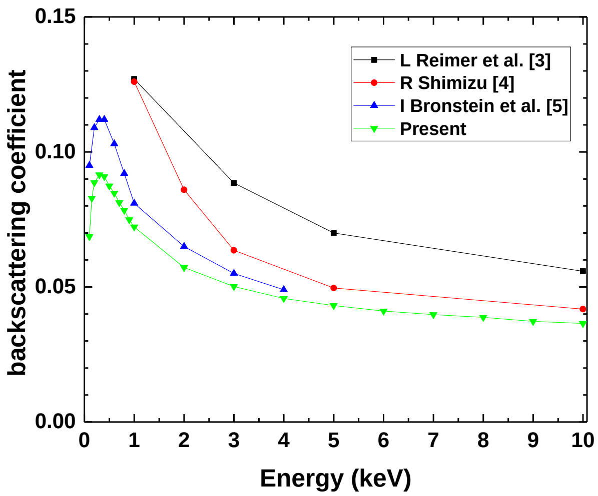

Figure 1. Electron backscattering coefficient as a function of incident electron energy.

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