Investigation of Multiple Ionization Effect in Sn with Low Energy H^+ Ions

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Synopsis The total L shell X-ray production cross sections for Tin (Sn) has been investigated with protons in the low energy region i.e. 260 – 400 keV. An important phenomenon i.e. Multiple Ionization (MI), which influences the X-ray production process has been included. Theoretical predictions are made on the basis of the ECPSSR model with united atom (UA) correction as well as with ECPSSR theory including the MI effect. The calculated values are compared with the available experimental measurements. It is observed that the MI effect improves the results.

The ion-induced collisions in the matter have revealed many interesting features in a number of diverse fields such as radiation, atmospheric physics and biomedical sciences [1, 2]. For a charged particle impact, the fundamental process of interaction is dominated by the direct Coulomb ionization. Earlier, results based on single-vacancy configuration [3] are erratic at low energy region. Later on, it is recognized that an ion impinging in the atom does not create a single hole only but also a number of additional vacancies which varies fluorescence and Coster-Kronig probability [4]. All this is attributed to a significant phenomenon known as multiple ionization (MI) [5].

Thus to explore its importance (MI effect), we have reported total L shell X-ray production cross sections for Sn at low proton energy ranging from 260 keV to 400 keV (see Fig. 1). The investigations are made with ECPSSR-MI and ECPSSR-UA using fluorescence yield and Coster-Kronig probabilities of Krause [6]. The calculated values are then compared with experimental measurements of different workers at available energies [7–10]. The theoretical predictions with MI effect are represented by the solid line while those with UA are by the dashed line. Whereas, experimental points are denoted by different symbols. From Fig., it is observed that the cross sections get enhanced due to the inclusion of MI effect. It is also noticed that it reduces the difference between experimental and calculated values. The detailed results will be discussed during the conference.

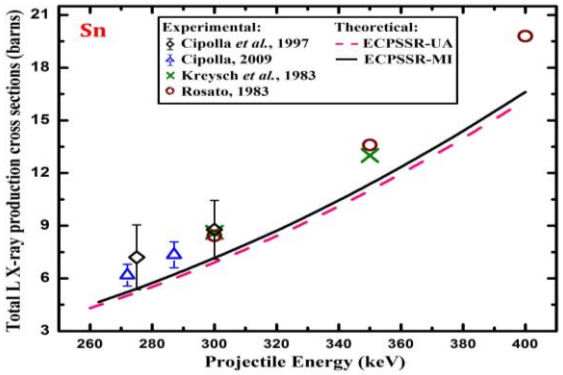

Figure 1. Total L shell X-ray production cross sections of **Sn** as a function of projectile energy.

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