Reply to "Comment on 'Coster-Kronig L-shell yield f_{23} of Dy, W, and Bi'"

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In the preceding Comment [Phys. Rev. A **65**, 036501 (2002)], Kumar *et al.* claim that f_{23} values obtained by Şimşek [Phys. Rev. A **62**, 052517 (2000)] for Dy, W, and Bi must be associated with an enormously large error. For this reason, we have rechecked all the calculations used to obtain the f_{23} yield. As a result, we have found out that the error analysis was inaccurate as claimed by the writers of the Comment, but there is no typographical error in the Eq. (4) of our paper contrary to the claim of Kumar *et al.* In addition, the method of using equivalent Al target to estimate the additional excitation by 59.5-keV photons scattered from primary target is accurate.

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In their Comment on our work, Kumar *et al.* suggest that ${N^3}_{L\alpha}$ should be used instead of ${N^2}_{L\alpha}$ in Eq. (4) of [1]. Here Eqs. (2) and (3) correspond to the $K\beta$ and average K x-ray energy of the primary target used to excite the L_2 subshell of the secondary target, respectively. Although the $K\beta$ x-ray energy of the primary target is above the L_2 edge, average K x-ray energy of the primary target is the below L_2 edge. Therefore, the use of ${N^3}_{L\alpha}$ instead of ${N^2}_{L\alpha}$ in Eq. (4) of [1] can be misunderstood by readers as a point that the L_2 subshell of the secondary target is not excited. For this reason, the equation from which the f_{23} yield is obtained must be like Eq. (4) of [1].

The method of using an equivalent Al scatterer to estimate the contribution to L x-ray production due to scattered photons by the primary target is a completely experimental method. This method, used safely by many investigators [2–4], does not consist of any theoretical parameter contrary to method used by Singh *et al.* [5]. When the spectrum given in Fig. 2 of [1] is carefully examined, it is seen that the $L\gamma$ peak obtained using the primary target is the same as the $L\gamma$ peak obtained using an equivalent Al scatterer. The $L\gamma$ x rays are produced by ionization of the L_1 and L_2 subshells by the 59.5-keV photons scattered from the primary and equivalent Al target. The lack of the $L\gamma$ peak in the obtained net spectrum in Fig. 2(b) of [1], following the spectrum subtraction, supports that the method is accurate. In addition to the above information, 59.5-keV photons from Am-241 fall on the secondary target after being first scattered from the primary target. These photons are later scattered from the secondary target and are recorded with a Si(Li) detector. Since all of the spectra of radiation from the Bi target is not shown in Fig. 2 of Ref. [1], the peaks belonging to γ rays scattered from the secondary target for the second time are not visible in the spectrum. The peaks of γ rays scattered coherently and incoherently obtained by using the equivalent Al target and primary target are almost the same. The fact that these peaks are the same reveals that the method of using the equivalent Al target is accurate.

As expressed by Kumar *et al.*, the error analysis given in the Result and Discussion section of [1] is not accurate. The errors in various parameters used to obtain f_{23} yield are smaller than the ones given in [1] by us. Since f_{23} was obtained from Eq. (4) of [1] as a difference of two terms of almost equal size, it is possible that the f_{23} values have a large error even though the errors in these parameters are smaller.

We are grateful to the writers of the Comment for giving us a chance to see this mistake in error analysis.We would like to thank Dr. Mehmet Takkac for his help in writing this article in English.

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