Alignment of atomic inner shell vacancies - A detailed study

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Alignment is accounted in terms of alignment parameter $A_{20}$, the fractional difference of the photo-ionization cross-sections of magnetic sub-states. The alignment of vacancies results in anisotropic distribution of X-rays originating from the filling of the vacancies as alignment is exhibited by directional correlation and polarization of characteristic X-rays and Auger electrons emitted on decay of the vacancies. Direct measurements of dependence of photo-effect on magnetic sub-states are not possible, but can be derived from the observed radioactive transitions or non-radioactive emissions. In the current work alignment studies are made for rare earth and high Z-elements using theoretical, empirical and experimental approaches. The theoretical value of alignment parameter $A_{20}$ has been calculated by using the non-relativistic dipole approximation in a point Coulomb potential and analytical perturbation theory in a screened Coulomb potential. For empirical evaluations, IGELCS interpolated experimental LXRF cross-section values are used along with radiative decay rates. The experimental measurements have been performed in XRF laboratories of Raja Ramanna Centre for Advanced Technology (RRCAT-India) using a three dimensional double reflection set-up. The comparison of alignment studies has been found almost similar via above methods and the alignment values at the L3 threshold energy >0.1 were certainly higher (5-8%) than the earlier quoted experimental results of various groups.

Biography

Ajay Sharma completed his PhD in Atomic and Radiation Physics from Nuclear Science Laboratories, Punjabi University, India. He has 15 years of teaching and research experience. His research interest includes; atomic inner shell studies and its quantum mechanical comparison for different parameters. He has a number of publications in journals of repute and a book on Alignment Studies. He is a life member of Indian Society for Atomic and Molecular Physics (ISAMP) and Indian Society for Radiation Physics (ISRP). He is also serving as Reviewer and Editorial Board Member of repute.

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