This Week's Citation Classic

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Bambynek W, Crasemann B, Fink R W, Freund H U, Mark H, Swift CD, Price R E & Rao P V. X-ray fluorescence yields, Auger, and Coster-Kronig transition probabilities. *Rev Mod. Phys.* 44:716-813,1972; 46:853, 1974. (Erratum.)
[Bur Centr. Mesures Nucl.. EURATOM, Belgium; Dept. Phys., Univ. Oregon, OR; Sch. Chem., Georgia Inst. Technol., GA; Ames Res. Ctr., NASA, Moffett Field, CA; Lawrence Livermore Lab., CA; Dept. Phys., Emory Univ., GA]

The present status of the field of fluorescence yields, radiationless (Auger and Coster-Kronig), and radiative transition probabilities is summarized. Tables of experimental and theoretical results are included, and tables of 'best values' of important quantities are presented. [The *SCI*® indicates that this paper has been cited over 570 times since 1972.]

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"In 1965, the Radionuclides Group at Geel participated in an international comparison to determine the radioactive concentration of a ^{54}Mn solution. We used various independent techniques to avoid hidden systematic errors. One of the methods yielded results which were too high compared with those obtained from all the other techniques. After a careful check of the reliability of the results, we concluded that the deviation was due to a wrong value of the K-shell fluorescence yield which was taken from the literature. From our measurements we could deduce a more accurate, but about 15 percent higher, value than generally accepted. We failed to communicate this result quickly because the editors of two different journals thought that we should try to find our own experimental errors.

"This caused me to make a survey of K-shell fluorescence yields in order to evaluate in depth the reliability of the generally accepted values. This work resulted in an engagement in this field for many years. We performed accurate measurements at various atomic numbers and could, together with the results determined at that time by other authors, establish a new curve for the K-shell fluorescence yield.

"At that time there was a considerable revival of interest in atomic radiationless transitions and fluorescence yields. R.W. Fink and his collaborators were engaged in the determination of accurate L-shell fluorescence yields.[1] B. Crasemann and his co-workers were calculating theoretical values for the innershell vacancy radiationless transitions.[2] H. Mark and his colleagues had completed an extensive set of measurements of average L-shell fluorescence yields.[3] P.V. Rao and his co-workers were adopting coincidence methods to measure L-subshell x-ray and Coster-Kronig yields.[4]

"The common interests of these authors naturally brought them together to consider the updating of the 1966 review on fluorescence yields.[5] As a result of two years of collaboration, we came up with a more comprehensive presentation of the field of x-ray fluorescence and radiationless transitions from initial single-vacancy atomic states, instead of an updated version of the earlier review.

"This review has been cited for several reasons. During the decade following its publication, the interest in atomic physics involving innershell vacancy states underwent a renaissance. The advent of fast computers and the development of new detectors and new experimental techniques made feasible the study of problems which had been set aside as intractable for many years. The review appeared just in time to supply theoretical and numerical values necessary for the interpretation of the new generation of experiments involving atomic innershell processes.

"In the meantime the atomic innershell processes were reviewed in much more detail in two volumes edited by Crasemann.[6] New sets of values that are mutually consistent and compatible with the available body of information on yields and related quantities were generated for fluorescence Coster-Kronig and Auger yields and published recently by MO. Krause."[7]

1. **Freund H U& Fink R W.** Bismuth L-subshell fluorescence yields and Coster-Kronig transition probabilities from decay of Pb^{210} (RaD). *Phys. Rev.* 178:1952-60, 1969.
2. **Kostroun V O, Chen M H & Crasemann B.** Atomic radiation transition probabilities to the 1*s* state and theoretical K-shell fluorescence yields. *Phys. Rev. A* 3:533-45, 1971.
3. **Price R E, Mark H & Swift** C **D.** Measurements of L_2 and L_3-subshell fluorescence yields in heavy elements. *Phys. Rev.* 176:3-10, 1968.
4. **Rao P V, Wood R E, Palms J M & Fink R W.** Electron-capture decay of Bi^{207}: *L*.-subshell fluorescence yields and Coster-Kronig transition probabilities of Pb. *Phys. Rev.* 178:1997-2006, 1969.
5. **Fink R W, Jopson R C, Mark H** & Swift C D. Atomic fluorescence yields. *Rev. Mod. Phys.* 38:513-40, 1966.
6. **Crasemann B,** ed. *Atomic inner-shell processes.* New York: Academic Press, 1975. 2 vols.
   Krause M O. Atomic radiative and radiationless yields for K and L shells. *J. Phys. Chem. Ref. Data* 8:307-22. 1979.