X - RAY ABSORPTION STUDY OF CERIUM INTERMETALLICS*

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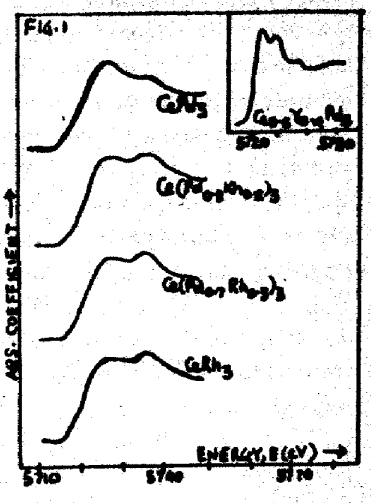
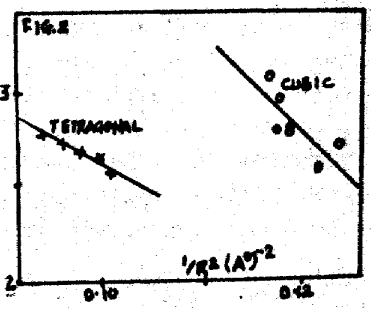
We present here the resuls of our work on the L_{III} absorption edge spectra in the cerium intermetallics $CePd_3$, $CeRh_3$, $Ce(Pd_{1-x}Rh_x)_3$ where x = 0.1 - 0.6 and $Ce_{1-x}Y_xPd_3$ where x = 0.1 - 0.4 and CeM_2Si_2 (M=Fe,Co,Ni,Cu,Ir and Ru), crystalizing in $AuCu_3$ and $ThCr_2Si_2$ type structures respectively. Some typical edge profiles are shown in Fig.1. These profiles show two pronounced maxima corresponding to Ce^{3+} and Ce^{4+} separated from each other by 7 - 10 eV. It is interesting to note from the Fig.1 that in $Ce(Pd_{1-x}Rh_x)_3$ system, the intensity of the peak corresponding to Ce^{4+} is greater than that corresponding to Ce^{3+} for $x \geq 0.2$. This may perhaps be due to presence of tetravalent cerium in higher cocentration in $CeRh_3$. /1/ A linear correlation is observed between the energy difference (ΔE) between the two peaks belonging to Ce^{3+} and Ce^{4+} ions and the cerium - near - neighbour distance (R). This correlation is found to depend on the structure. In both the $AuCu_3$ and $ThCr_2Si_2$ type compounds a negative slope of about 130 is obtained and this is entirely differant than those derived by Natoli /2/ on the basis of multiple scattering formalism. This could be ascribed to the presence of metallic ligand to the absorbing atom in the intermetallic system. Although ΔE gives a measure of avarage valence of the mixed valent compound there seems to be no direct coorelation between ΔE and valence v derived from L_{III} edge spectra In fig.2 we have plotted a graph of $\Delta E/v$ versus $1/R^2$ which can be used with a fairly good accuracy to predict the valence in cerium compounds having similar structure. Our estimated values for cerium compounds obtained from the graph are in good agreement with those reported in literature. Attempts are being made to test the validity of this relation for other mixed valent cerium and europium compounds.





/1/ R.Harris et al., J.Less Common Met. 22, 299 (1972)
/2/ C.R.Natoli, EXAFS and Near Edge Structure, ed. A.Bianconi, L.Incoecia and S.Stipcich, Springer Verlag, Berlin, 1983, p 43
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