HEAT CAPACITY OF AMORPHOUS $Y_xCe_{50-x}Cu_{42}Al_8$ ($0 \leq x \leq 50$) ALLOYS

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Heat capacity results for as-quenched $Y_xCe_{50-x}Cu_{42}Al_8$ ($0 \leq x \leq 50$) amorphous alloys in the temperature range 1.7–200 K are presented to discuss Y-Ce substitution effect. Samples in the shape of ribbons were synthesized by a single-roller rapid quenching technique in argon atmosphere. The $Y_xCe_{50-x}Cu_{42}Al_8$ alloys exhibit a significant glass forming ability. There is also the evidence of paramagnetic/superparamagnetic behavior with the ordering of Ce moments (for samples with $0 \leq x \leq 40$) even at low temperatures. The effective magnetic moment of Ce decreases with increasing Y content. The main aim of the study reported here is the determination of specific heat and the influence of Y by Ce substitution effect on the effective Sommerfeld coefficient γ_{eff}. While there is no long range ordering in investigated amorphous alloys, the properties may vary between each composition due to the differences in short range order but also as a consequence of the magnetic ordering of Ce ions. With increasing applied magnetic field the Schottky type maximum appears, which moves to higher temperatures with magnetic field increasing up to 9ÂăT as usually connected with crystal field splitting. There is a significant low temperature upturn in $CT^{-1}(T^2)$ dependence, which is more intense for $Ce_{50}Cu_{42}Al_8$ alloy. The low temperature extrapolation of $CT^{-1}(T^2)$ yields close to 1.2 J/molK^2, which is similar to other heavy fermion Ce-compounds e.g. $CeCu_4Al$ [1]. The magnitude of this upturn depends strongly on the composition and vanishes for $Y_{50}Cu_{42}Al_8$ alloy which possess no magnetic ions. Electronic heat capacity coefficient γ_{eff} increases with the substitution of Y by Ce atoms, which implies that the alloys with Ce content $x>20$ have the tendency to a heavy fermion behaviour due to increasing hybridisation effect of Ce 4f-electrons.

[1] M. Reiffers et al., Acta Phys. Pol. **113** (2008) 423