Magnetic ordering and valence instability in Kondo system
$\text{CeMn}_{2-x}\text{Cu}_x\text{Si}_2$ GAN LIANG, SHELLEY KEITH, JESSE VERNON, Sam Houston State University, F. YEN, University of Houston — The transition from a 3d-antiferromagnetically ordered mixed valence system to a Kondo lattice system has been studied for the $\text{CeMn}_{2-x}\text{Cu}_x\text{Si}_2(0 \leq x \leq 1)$ series. The Ce L$_3$-edge x-ray absorption result shows that the series evolves from a Ce mixed valence system at $x = 0$ to a nearly trivalent system at $x = 2$. The resistivity results show that in the low Ce valence region ($x$ greater than 1.0), the system exhibits a crystalline-field modified Kondo lattice behavior. In the high valence region, however, the system displays a behavior of the prototype mixed valence compound CePd$_3$. Magnetization (M) data were taken in both zero-field-cooled (ZFC) and field cooled (FC) processes. It is found that for $0 \leq x < 0.4$, Neel temperature decreases rapidly with the increase of the Cu concentration $x$. In the range of $0.4 \leq x < 0.8$, ferromagnetic phase is observed below 150 K, and both the ordering temperature $T_c$ and Curie-Weiss temperature $\theta$ decrease with the increase of $x$. For $x \geq 0.8$, the $M$ ($T$) curves are reversible and display paramagnetic behavior. Thus, the system is non-magnetic as it approaches heavy-fermion compound CeCu$_2$Si$_2$. Finally, a magnetic phase diagram is proposed for this compound series.

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