From heavy fermion and spin-glass behavior to magnetic order in CeT_4M compounds

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We report on the transitions between the ferromagnetic order, spin-glass behavior, heavy fermion and fluctuating valence state in a series of isostructural compounds CeT_4M (T = Ni, Cu; M = Al, Ga, Mn). The dilution of the T or M elements allowed us to follow the physical properties evolution employing the measurements of the heat capacity, Seebeck effect, electrical and thermal transport, magnetic susceptibility, frequency dependent ac magnetic susceptibility, magnetization relaxation, inelastic neutron scattering and also the X-ray photoemission spectroscopy. It is shown that the Mn reach compounds lean towards the spin glass behavior. For the compounds governed by the close to localization Ce 4f states the effect of the crystal electric field has been studied. It has been shown that the spin glass-like behavior can significantly influence the physics of the CeT_4M compounds.