Abstract Submitted
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Investigation of magnetic ordering in the chemical substitution series $CeCu_2(Si_{1-x}P_x)_2$[1] YOU LAI, ANDREW GALLAGHER, Florida State Univ, LIUSUO WU, ANDREW CHRISTIANSON, ORNL, RYAN BAUMBACH, NHMFL — $CeCu_2Si_2$ is an exemplary correlated electron metal that features two domes of unconventional superconductivity in its temperature-pressure phase diagram. The first dome surrounds an antiferromagnetic quantum critical point, whereas the more exotic second dome may span the zero temperature termination point of a line of f-electron valence transitions. It has been proposed that the second superconducting dome encompasses a quantum phase transition that is associated with a Ce $4f$-electron valence collapse, but this has yet to be established. In order to clarify this question, we recently investigated the chemical substitution series $CeCu_2(Si_{1-x}P_x)_2$ for $x \leq 0.1$, where Si $\rightarrow$ P replacement is understood as electronic tuning. Complex magnetism and other interesting behaviors are induced, with three distinct magnetic regimes appearing with increasing x. Using elastic neutron scattering, we report an in-depth study of the magnetic ordering in the $CeCu_2(Si_{1-x}P_x)_2$ series. We discuss the implications of this behavior for understanding the cerium valence, and for stabilizing remarkable behaviors throughout the CeT_2X_2 (T = transition metal and X = Si, Ge) family of materials.

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