Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Enhancement of hidden order and antiferromagnetism in Fe and Os substituted URu_2Si_2 under pressure.[1] CHRISTIAN WOLOWIEC, NORAVEE KANCHANAVATEE, KEVIN HUANG, SHENG RAN, M. BRIAN MAPLE, Univ of California - San Diego — We present electrical resistivity measurements made under pressure for the Fe and Os substituted URu_2Si_2. The parent compound URu_2Si_2 exhibits a hidden order (HO) phase below $T_0 = 17.5$ K at ambient pressure. A phase transition from HO to a large moment antiferromagnetic (LMAFM) phase is induced by applying pressure P or by substituting Fe or Os for Ru ions. While the substitution of smaller Fe ions reduces the unit cell volume thus creating a positive chemical pressure P_{ch}, the substitution of larger Os ions results in a negative P_{ch}. As Fe concentration (x) is increased, the critical pressure P_c forcing the HO to LMAFM phase transition is reduced from 1.4 GPa at $x = 0$ to 0 GPa at $x = 0.15$. By converting x to $P_{ch}(x)$, we found that $P_{ch}(x) + P_c \approx 1.5$ GPa at the phase transition. These results suggest that P_{ch} behaves like external Pin inducing the HO $\rightarrow$ LMAFM phase transition. However, we also found that as the Os concentration (y) is increased, a smaller P_c is required to induce the HO $\rightarrow$ LMAFM phase transition: $P_c \sim 1.4$ GPa at $y = 0$ reduces to $P_c \sim 0$ GPa at $y = 0.065$. This is contrary to what one would expect from a negative P_{ch} effect. Hence, the Os substitution study suggests that P_{ch} is not solely responsible for inducing the LMAFM phase.

[1]The pressure research and materials synthesis were supported by the U.S. DOE under Grant No. DE-NA0002909 and DE-FG02-04-ER46105, respectively.

Christian Wolowiec
Univ of California - San Diego

Date submitted: 10 Nov 2016 Electronic form version 1.4