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Competition between magnetism and superconductivity in Eu-based intermetallic compounds[1] MACY STAVINOHA, Rice University, LANCE GREEN, JULIA CHAN, The University of Texas at Dallas, EMILIA MOROSAN, Rice University — Eu-based intermetallic compounds present a path to discover new correlated electronic behavior in quantum materials. Reports of superconductivity, intermediate valence behavior, and heavy fermions indicate that Eu-based compounds are promising routes to study the relationship between crystallography and electronic properties. The present work is focused on $EuGa_4$, an antiferromagnet with $T_N = 16$ K isostructural with the tetragonal RT_2M_2 (R = rare earth, T = transition metal, M = metal or metalloid) family that exhibits heavy fermion behavior and unconventional superconductivity. Single crystals of the doped series $(Eu_{1-x}La_x)Ga_4$, $(Eu_{1-x}Ca_x)Ga_4$, and $Eu(Ga_{1-x}Al_x)_4$ have been grown using the self-flux method and tested for change in unit cell volume and magnetic susceptibility. Results show that doping with Ca (isoelectronic doping) and La (hole doping) reduce T_N to 12.4 K and 2.3 K, respectively, for Ca doping up to x = 0.11 and La doping up to x = 0.74 without an associated change in unit cell volume. The series $Eu(Ga_{1-x}Al_x)_4$ has shown incommensurate-to-commensurate magnetic transitions. Future studies will aim to further decrease T_N and the unit cell volume using physical pressure and chemical pressure through doping.

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