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Evolution of the bulk properties, structure, magnetic order, and superconductivity with Ni doping in $CaFe_{2-x}Ni_xAs_2$ SONGXUE CHI, Natl Inst Stand & Technol, NIST Center for Neutron Research, NEERAJ KUMAR, Tata Inst Fundamental Res, Dept Condensed Matter Phys & Mat Sci, YING CHEN, Natl Inst Stand & Technol, NIST Center for Neutron Research, KUMARI GAURAV RANA, A.K. NIGAM, A. THAMIZHAVEL, Tata Inst Fundamental Res, Dept Condensed Matter Phys & Mat Sci, WILLIAM RATCLIFF, Natl Inst Stand & Technol, NIST Center for Neutron Research, S.K. DHAR, Tata Inst Fundamental Res, Dept Condensed Matter Phys & Mat Sci, JEFFREY W. LYNN, Natl Inst Stand & Technol, NIST Center for Neutron Research — Magnetization, susceptibility, specific heat, resistivity, neutron and x-ray diffraction have been used to characterize the properties of $CaFe_{2-x}Ni_xAs_2$ as a function of Ni doping. The combined first-order structural and magnetic phase transition occur together in the undoped system, with a small decrease in the area of the $a-b$ plane along with an abrupt increase in the length of the c-axis in the orthorhombic phase. With increasing x the transition temperature decreases but remains sharp at modest dopings. At larger dopings the transition is more rounded, and decreases to zero for x$\approx$0.06 where superconductivity develops. The regime of superconductivity is quite restrictive, with a maximum T_C of 15 K and an upper critical field H_{C2}=14 T. Superconductivity disappears in the overdoped region.

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