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Cerium-Iron Magnetic Coupling in Single Crystal CeFeAsO at Low Temperatures[1] QIANG ZHANG, WEI TIAN, H.-F. LI, J.-Q. YAN, T.A. LOGRASSO, Ames Laboratory, U.S. DOE, R.W. MCCALLUM, Ames Laboratory; Department of Materials Science and Engineering, Iowa State University, J.L. ZARESTKY, DAVID VAKNIN, Ames Laboratory; Department of Physics and Astronomy, Iowa State University, J.W. KIM, Argonne National Laboratory, H. CAO, Oak Ridge National Laboratory — Neutron and synchrotron resonant X-ray scattering techniques have been used to determine the intricate magnetic structure of single crystal CeFeAsO at low temperatures, way below the spin-density wave (SDW) transition around 130 K associated with Fe moments ordering. Our synchrotron X-ray scattering results at the Ce L_{II-}edge clearly show a magnetic transition that is specific to the Ce ordering at $T_{Ce} = 4$ K, whereas neutron diffraction data indicate a transition at $T* = 12$ K with unusual order parameter. Detailed order parameter measurements on the (100) & (101) magnetic reflections by neutrons show an anomaly at $T = 4$ K which we associate with the Ce ordering. The successive transitions at T_{Ce} and T^* can also be clearly identified by two anomalies in heat capacity measurements. We argue that the higher transition temperature observed in neutron measurements reflects Fe-Ce combined rearrangement prior to the complete ordering of the Ce. The effect of the weak Ce-Fe coupling on the rearrangement of Fe ordering is yet another example of the vulnerability of the Fe-SDW as influenced by minute doping or by relatively low applied pressures.

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