Abstract Submitted
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Phonon and magnetic excitations in the novel BaFe1.8Co0.2As2 superconductor DAN PARSHALL, Univ of Tennessee, Dept of Physics, KONSTANTIN LOKSHIN, Univ of Tennessee, Dept of Materials Science, MATTHEW STONE, DOUGLAS ABERNATHY, MARK LUMSDEN, ANDREW CHRISTIANSON, DAVID MANDRUS, ATHENA SAFA-SEFAT, ORNL, TAKESHI EGAMI[1], ORNL; Univ of Tennessee, Depts of Physics and Materials Science — Phonon and magnetic excitations in the BaFe1.8Co0.2As2 superconductor single crystal were studied by inelastic neutron scattering using the ARCS time-of-flight spectrometer at the Spallation Neutron Source. Most of the phonon branches show a good agreement with the density functional theory calculations. However, the As-Raman vibrations along the c-axis demonstrate strong softening contrary to the flat behavior expected from the LDA calculations. The softening is strongest along the (0.5, 0.5, L) direction, by up to 4 meV. At the same time a sharp magnetic response was found along the same (0.5, 0.5, L) direction over a wide range of L-values at energy transfer of 10-25 meV. This dynamic magnetic responds indicates on a 2-D character of antiferromagnetic spin fluctuations in the superconducting phase, in strong contrast to the 3-D static antiferromagnetism in the undoped non-superconducting BaFe2As2. Thus, in Fe-As based superconductors magnetism shows strong sensitivity to the lattice, suggesting a possibility of spin-phonon coupling playing a role in superconductivity.

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