Log #MAS20-2020-000155

Abstract Submitted
for the MAS20 Meeting of
The American Physical Society

Sorting Category: 03.0 (E)

Coupling of fully symmetric As phonon to magnetism in iron based superconductors[1] SHANGFEI WU, Rutgers University, WEILU ZHANG, Sophia University, LI LI, HUIBO CAO, ATHENA SEFAT, Oak Ridge National Laboratory, HSIANG-HSI KUNG, University of British Columbia, HONG DING, IOP,CAS, PIERRE RICHARD, Universite de Sherbrooke, GIRSH BLUMBERG, Rutgers University — Raman coupling to the fully symmetric As phonon A_g(As) in iron based superconductors is forbidden for the XY scattering geometry with cross-polarized light along the Fe-As directions in the tetragonal phase, whereas it becomes allowed in the orthorhombic phase: The emerging modes intensity indicates the lattice orthorhombicity, which is expected to be small. However, in the orthorhombic phase of several families of parent compounds of Fe-based superconductors ($BaFe_2As_2$, NaFeAs, FeSe, and LaFeAsO) [1], as well as in the gold doped compounds $Ba(Fe_{1x}Au_x)_2As_2$ [2], we find that the A_g(As) phonon intensity is significantly enhanced when the magnetic order sets in below the Neel temperature T_N. The A_g(As) phonon also shows an asymmetric line shape below T_N and an anomalous linewidth broadening upon Au doping. By the Fano model analysis, we conclude the temperature dependence of light coupling amplitude to the A_g(As) phonon follows the evolution of the magnetic order parameter. We propose that the intensity enhancement of the A_g(As) phonon is due to electronic anisotropy induced by the collinear spin density wave order. [1]Phys.Rev.Research 2, 033140 (2020) [2]Phys.Rev B 102, 014501 (2020)

[1]The spectroscopic work conducted at Rutgers was supported by NSF Grant No. DMR-1709161.

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[X] Prefer Oral Session
[ ] Prefer Poster Session

Date submitted: 02 Nov 2020 Electronic form version 1.4