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Monday–Friday, March 14–18, 2022; Chicago

Session D63: Charge Order and Charge Density Waves

3:00 PM–5:36 PM, Monday, March 14, 2022

Room: Hyatt Regency Hotel -Grant Park A

Sponsoring Unit: DCMP

Chair: Natalia Drichko, Johns Hopkins University

Abstract: D63.00008 : Raman scattering study of kagome metal AV_3Sb_5 (A=Cs,Rb,K)*

4:24 PM–4:36 PM

← Abstract →

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The kagome metal AV_3Sb_5 was recently discovered to host both superconductivity and charge density wave (CDW) order. Here, we use Raman scattering to probe the lattice dynamics of AV_3Sb_5 . We identify several new A_{1g} and E_{2g} phonon modes related with V and Sb atoms as well as alkali atoms emerging in the CDW state. The symmetry decomposition analysis for these emerging modes indicates the C_3 symmetry is preserved in the CDW phase. The limited number of new phonon modes indicates inversion symmetry is also preserved in the CDW phase. The detailed temperature evolution of these modes' peak frequency, half-width-at-half-maximum, and integrated area support two successive phase transitions in CsV_3Sb_5 : the first one with the primary-like order parameter appearing at $T_S = 94$ K and the second one with secondary-like order parameter appearing at $T^* = 80$ K. Moreover, the T-dependence of the integrated area for these modes show two type of behavior below T_S : the low energy modes shows a plateau-like behavior below T^* while the high energy modes monotonically increase below T_S . These two types of behaviors below T_S can be captured by a Landau free energy model incorporating the interplay between the primary-like and secondary-like order parameters.

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