**PC1-3**

# Structural quantum criticality, soft phonons and strong-coupling superconductivity in $(Ca_xSr_{1-x})_3Rh_4Sn_{13}$

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Approaching a quantum critical point (QCP) has been an effective route to stabilize superconductivity. While the role of magnetic QCPs has been extensively discussed, similar exploration of a structural QCP is scarce due to the lack of suitable systems with a continuous structural transition that can be conveniently tuned to 0 K. In this presentation, I will demonstrate the existence of a structural QCP in $(Ca_xSr_{1-x})_3$Rh4$Sn_{13}$ (Figure 1 and Ref. [1]), examine the evolution of the phonon spectrum as a function of the calcium content from inelastic x-ray scattering (Figure 2 and Ref. [2]) and heat capacity data [3]. Specifically, the inelastic x-ray scattering data unambiguously point to the softening of phonon modes around the **M** point of the Brillouin zone on cooling towards the structural transition. At x = 0.85, the soft mode energy squared at the **M** point extrapolates to zero at (-5.7 ± 7.7) K (Figure 2(h)), providing the first compelling microscopic evidence of a structural QCP in $(Ca_xSr_{1-x})_3Rh_4Sn_{13}$. Our spectroscopic, thermodynamic and transport data show that the tuning of the phonon spectra in $(Ca_xSr_{1-x})_3Rh_4Sn_{13}$ offers a systematic route to realize strong-coupling superconductivity.

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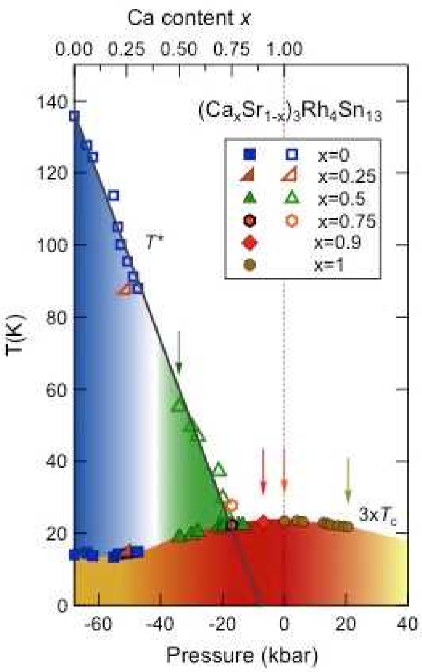


Figure 1

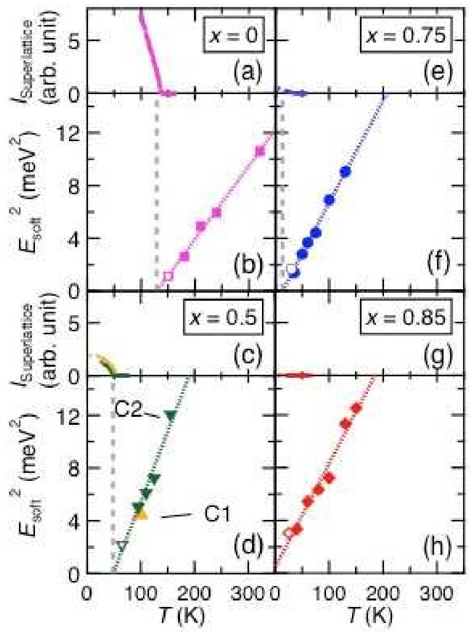


Figure 2