
S E M I N A R
on
Semiconductor Physics and Nanotechnology

Di, 07.11.2023, 09:00 Uhr,

**Seminar in
person in the Physics lecture hall or via Zoom**

“Lattice, spin, and charge excitations in Fe(Se:S)”

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FeSe, the simplest of the iron based superconductors, is a puzzling material. As opposed to the related iron pnictides and FeTe, no long range magnetic order is found down to lowest temperatures. At the beginning, we use Raman scattering as a function of temperature and polarization to probe charge and spin dynamics in FeSe. In agreement with numerical simulations of a spin-1 Heisenberg model, several peaks in all Raman active symmetries can be assigned to spin excitations. The dominating feature is a peak in B_{1g} symmetry around 500 cm^{-1} which shows distinct temperature dependence. Further comparison of the simulations to neutron scattering data furnishes evidence for FeSe hosting nearly frustrated stripe order of local spins. In the second step, all types of excitations including phonons, spins, and charges are analysed in detail for Fe(Se:S). It is observed that the energy and width of the iron-related B_{1g} phonon mode vary continuously across the entire range of sulphur substitution. The A_{1g} chalcogenide mode disappears above $x = 0.23$ and reappears at a much higher energy for $x = 0.69$. In a similar way, the spectral features appearing at finite doping in A_{1g} symmetry vary discontinuously. The excitation centred at approximately 500 cm^{-1} disappears above $x = 0.23$ where the A_{1g} lattice excitations exhibit a discontinuous change in energy. The low-energy mode associated with fluctuations displays maximal intensity at the nematostructural transition and thus tracks the phase boundary. Finally, the evolution of lattice excitations as a function of tensile uniaxial strain is analysed.

References

- [1] A. Baum, H. N. Ruiz, N. Lazarević, Yao Wang, T. Böhm, R. Hosseinian Ahangharnejhad, P. Adelman, T. Wolf, Z. V. Popović, B. Moritz, T. P. Devereaux & R. Hackl, Communications Physics 2, 14 (2019).
- [2] N. Lazarević, A. Baum, A. Milosavljević, L. Peis, R. Stumberger, J. Bekaert, A. Šolajić, J. Pešić, Aifeng Wang, M. Šćepanović, A. M. Milinda Abeykoon, M. V. Milošević, C. Petrović, Z. V. Popović, and R. Hackl, Phys. Rev. B 106, 094510 (2022).

Zoom – Link:

<https://zoom.us/j/96375934537?pwd=RTIKTWk5ZDZlRlU211YTY1bGFxTUtpZz09>

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