10th International Conference on Inelastic X-ray Scattering (IXS2017)

DESY Hamburg, 28. Aug. – 1. Sept 2017

Book of Abstracts
Program

Friday, 1st September 2017

Session 12: Phonons

09:00 **Recent Results of Non-Resonant High-Resolution IXS at SPring-8**
Alfred Baron

09:40 **Exploring a new frontier: phonon propagation in complex and hybrid metamaterials**
Alessandro Cunsolo

10:10 **Phonon and phonon-like excitations in KNbO3 and KTa0.65Nb0.35O3**
Alexei Bosak

10:30 **Charge Order in the Cuprates: Effect of pressure**
Matthieu leTacon

11:00 Coffee break

Poster Prize Talks

11:20 Poster Talk 1

11:35 Poster Talk 2

11:50 Poster Talk 3

12:05 Poster Talk 4

12:20 Concluding remarks

13:10 End of Conference

14:40 Visit PETRA III (P64, P01)

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Phonon and phonon-like excitations in KNbO3 and KTa0.65Nb0.35O3

Alexei BOSAK 1, Tra NGUYEN-THANH 1, Adrien GIRARD 2, Anastasia RAGULSKAYA 3, Roman BURKOVSKY 4, Bjoern WINKLER 3, Dmitry CHERNYSHOV 5
1 ESRF, 2 University of Frankfurt, 3 Moscow State University, 4 Peter the Great Saint-Petersburg Polytechnic University, 5 Swiss-Norwegian Beam Lines at ESRF

Since the 1960s it is known that characteristic diffuse scattering is easily observable in KNbO3. Sheets of strong diffuse scattering are present in all high temperature phases above 263 K, but not in the rhombohedral phase which is stable at T < 263 K. It is still controversial whether the diffuse scattering is due to static disorder or soft phonons. Disorder may lead to diffuse scattering due to the weakly correlated chains in real space, which run perpendicular to the diffuse planes in momentum space. Alternatively, a soft phonon with a main displacement component perpendicular to the diffuse planes would lead to similar diffuse scattering. Only momentum resolved high resolution inelastic scattering experiments will allow us to distinguish between these two cases.
A combined inelastic x-ray scattering (IXS) and thermal diffuse scattering (TDS) study showed that the nature of the characteristic diffuse scattering in KNbO3 is symmetry dependent. For the orthorhombic phase it is solely due to locally soft phonons, while for the tetragonal and cubic phases phonons are strongly damped, and disorder is apparent in the central peak. This behavior can be explained by a geometric frustration mechanism, where dominating large displacements along <100>-type cubic axis are involved.
A related material, potassium tantalate-niobate, KTa1-xNbxO3 (KTN), is attracting interest due to its technological importance for optical applications due to a high quadratic electro-optic coefficient and excellent photorefractive effect. However, information on the lattice dynamics and disorder in this system is very limited, and a combined TDS/IXS study helped us to reveal the similarities and differences with the parent compound KNbO3.

Charge Order in the Cuprates: Effect of pressure

Matthieu LeTacon
KIT

Charge order competing with superconductivity has now been observed in essentially all families of high temperature superconducting cuprates. I will briefly review some of the key experimental results obtained in the last couple of years and focus more specifically on the insights gained from high resolution inelastic x-ray scattering. The observation of a quasi-elastic 'central peak' unraveled the static nature of the CDW correlations, attributed to the pining of CDW nanodomains on defects[1]. Low energy phonons exhibit anomalously large superconductivity induced renormalizations close to the CDW ordering wave vector, providing new insights regarding the long-standing debate of the role of the electron-phonon interaction, a major factor influencing the competition between collective instabilities in correlated-electron materials. Further exploiting the versatility of the IXS technique, we show how this interplay can furthermore be tuned with the use of high pressures [2].
[1] M. Le Tacon et al., Nature Physics 10, 52 (2014).
[2] S.M. Souliou et al., in preparation.