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New insights on the cuprates phase diagram from x-ray scattering

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I will present an overview of the results obtained from various x-ray scattering experiments on high temperature superconducting cuprates in the last couple of years.
I will first focus on Cu L-edge resonant scattering experiments that led us to uncover charge density wave (CDW) correlations competing with superconductivity in the YBCO family, for which a complete temperature and doping dependent phase diagram has been worked out.
These investigations have been extended to other families of cuprates (Bi2201, Bi2212 and Hg1201) demonstrating the ubiquity and the universality of the phenomenon.
Further information was 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. 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.
Finally I will discuss new results obtained in a heterostructure comprising YBCO and metallic ferromagnet La2/3Ca1/3MnO3, where a stabilization of the CDW phase is concluded and discussed within the scope of tuning the equilibrium conditions of metastable phases via heterostructuring.

Primary author: Dr LE TACON, Matthieu (Max Planck Institute for Solid State Research)

Presenter: Dr LE TACON, Matthieu (Max Planck Institute for Solid State Research)

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