Contribution ID: **2** Type: **not specified**

Phase separation in complex oxides: RTiO3

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Complex oxides display an unparalleled richness of physical phenomena arising from the coupling of their charge, spin and orbital degrees of freedom, with cuprate high Tc superconductors and colossal magnetoresistive (CMR) manganites as flagship materials systems. For the CMR systems, phase separation is believed to play a crucial role in creating the hypersensitivity to external stimuli such as external field [1]. In this contribution I will report our experiments on perovskite titanate systems, which are a t2g materials analogy to the CMR systems with which they share much underlying physics.
In particular, I will deal with calcium-doped rare earth titanium oxides, which exhibit charge and orbital ordering (CO/OO) during a temperature-driven metal-insulator transition (T-driven MIT). These systems are hypersensitive to the tuning of the hole-doping level, whereby the electrical transport then differs by several orders of magnitude [2], as occurs with external field in the CMR manganites. In this talk, I will present recently recorded data aimed at the investigation of the phase separation dynamics during T-driven MIT in titanates at LCLS using X-ray photon correlation spectroscopy techniques [3]. This is the first time that the single crystal coherent x-ray diffraction patterns have been recorded at 120Hz in the time domain.

References:
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Session Classification: Quantum materials

Track Classification: 2