

High Pressure Resonant X-ray Diffraction Set up at Beamline P09

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A new high pressure setup is being commissioned and tested at the beamline P09 at PETRA III, DESY, Hamburg. The purpose of this work is to extend the resonant single crystal diffraction capabilities of P09 [1] into the high pressure, low temperature regime to explore the effects of pressure on phases with magnetic and charge order. Hydrostatic pressure can be a useful tuning parameter in strongly correlated electron systems as it leads to changes to the lattice parameters, and orbital overlap. This in turn modifies the electronic hopping and magnetic exchange interactions and can alter the electronic and magnetic ground state of the material. We will present an overview of the high pressure capabilities at the beamline P09, including the use of diamond anvil cells for high pressure, low temperature single-crystal diffraction, and the in-situ application of pressure. Test measurements have been conducted on various transition

metal oxides, including a novel osmium oxide showing both magnetic and charge ordering at accessible temperatures [2]. This material is a useful test case for examining the effects of pressure while simultaneously tracking modulation and ordering of the charge, magnetic, and structural degrees of freedom via resonant and non-resonant X-ray diffraction.

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