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Revealing electronic, structural and magnetic phases in NdFeAsO with temperature-dependent electron energy-loss spectroscopy[1]
JUAN C. IDROBO, Vanderbilt U., MATTHEW F. CHISHOLM, ORNL, MICAH PRANGE, Vanderbilt U., STEPHEN J. PENNYCOOK, ORNL, SOKRATES T. PANTELIDES, Vanderbilt U., JING TAO, YIMEI ZHU, BNL, ZHI-AN REN, ZHONG-XIAN ZHAO, Chinese Academy of Sciences — Iron pnictides, quaternary compounds of the form (ReFeAsO, Re=rare-earth elements), present structural and magnetic phase transitions in the temperature range between 120 K to 150 K. In this talk, we report momentum transfer- and temperature-dependent electron energy-loss spectroscopy (EELS) studies of the parent compound NdFeAsO using (scanning) transmission electron microscopy. In particular, we find that both the Fe L_{23}-ratio and the Nd M_{45}-ratio increase, the intensities of the Fe L_1-edge and Nd M_3-edge reduce, and the O K- edge fine structure remains unchanged as the temperature decreases. Using a combination of experiments and total-energy first-principles calculations within density functional theory, we show that the changes of the EELS Fe and Nd fine structure can be directly correlated with changes on the electronic structure of NdFeAsO and Fe and Nd magnetic moments.

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