	Experiment title: Current driven metal-insulator transition in Cr-doped $SrTiO_3$; The effect of carrier doping on the cubic-tetragonal phase transition	**Experiment number**: HE-1832
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Electronic charge localization in 3d transition-metal oxides has attracted considerable interest in the past. These localization phenomena, which lead to metal-insulator transitions, play a crucial role in such materials as high-T_c cuprates and giant magneto-resistive manganates. Recently, we have found a current-driven insulator-metal transition with a memory effect in $SrTiO_3$ with 0.2 mol% Cr doping [1]. In these samples a current pulse can switch the electronic states between high resistance and low resistance and vice versa. We speculated that the transition is occurring due to a change in valence of the Cr dopant from Cr^{3+} to Cr^{4+} or Cr^{5+}, thereby providing free carriers that induce the insulator-metal transition. Recently, we have collected X-ray absorption near edge structure (XANES) data on an electrically formed Cr-doped $SrTiO_3$ crystal to gain more information on the role played by the valence state of Cr [2].

When exposed to an electrical field, the resistance of the initially insulating Cr-doped $SrTiO_3$ is reduced several orders of magnitude and a metal is obtained. In this experiment, we have studied the influence of this forming process on the ferrodistortive transition at approximately $T = 105$ K in Cr-doped $SrTiO_3$. The ferrodistortive transition does not seem to significantly depend on the position, i.e., anode, cathode or in the gap (see figure 1), even though the Cr below the anode is in a higher oxidation state [2]. The fully oxidized sample though has higher ordering temperature.

A detailed data analysis is in progress.

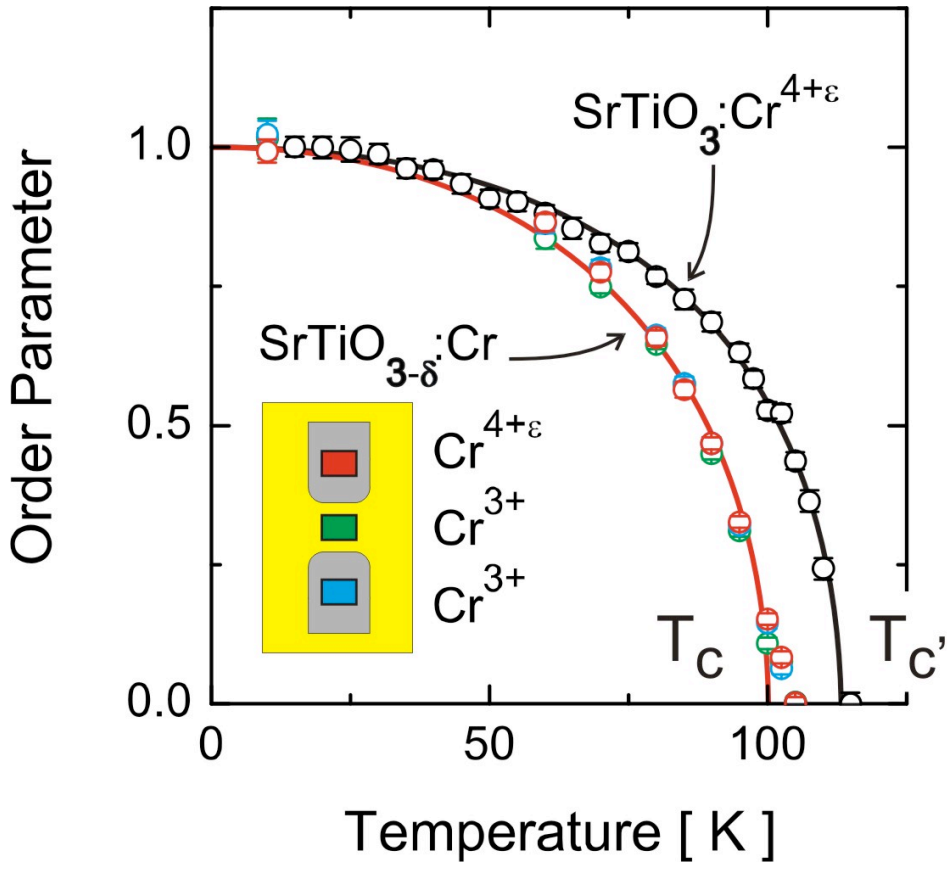

Fig. 1 shows the temperature dependence of the order parameter (square root of the superlattice reflection) of the ferrodistortive transition taken at different positions of the electrically contacted $SrTiO_3$ crystal. Also shown is the fully oxidized reference crystal ($SrTiO_{3-\delta}$:Cr).

[1] A. Beck, J. G. Bednorz, Ch. Gerber, C. Rossel, and D. Widmer, Appl. Phys. Lett. **77**, 139 (2000).

[2] G. I. Meijer, U. Staub, M. Janousch, S.L. Johnson, B. Delley, and T. Neisius, Phys. Rev. B **72**, 155102 (2005).