

Displacive Transition Revisited by Coherent X-ray Diffraction

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The perovskite oxide SrTiO₃ undergoes a prototypical example of structural phase transition, which stabilizes below $T_c=110$ K a antiferrodistorsive modulation at the $(1/2,1/2,1/2)$ reduced wave vector. However, this transition has been the first example where, in addition to the usual Lorentzian component in the critical x-ray scattering profiles, a sharp Lorentzian-squared component has been observed close to T_c . This sharp component was later found to be quite general in the class of structural phase transitions¹, and believed to correspond to a surface phase transition (10 to 100 μm depth), exhibiting a different critical behavior from the bulk (a second length scale) but the same transition temperature.

We show that the use of Coherent X-ray Diffraction (CXD) allows one i) to separate the different critical behaviors ii) to give evidence of the static character of the second length scale fluctuations and iii) to confirm it takes place in the near surface close to defects.

Beyond this experiment, we show that CXD is a valuable new tool to study phase transitions and defects in the low temperature ordering².

[1] Cowley R.A., *Physica Scripta*, 1996, T66, 24. [2] Le Bolloc'h D., et al., *in preparation*.

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