Ferroelasticity and Hysteresis in Mixed Ionic Electronic Conducting Perovskites (DMR-0201770)

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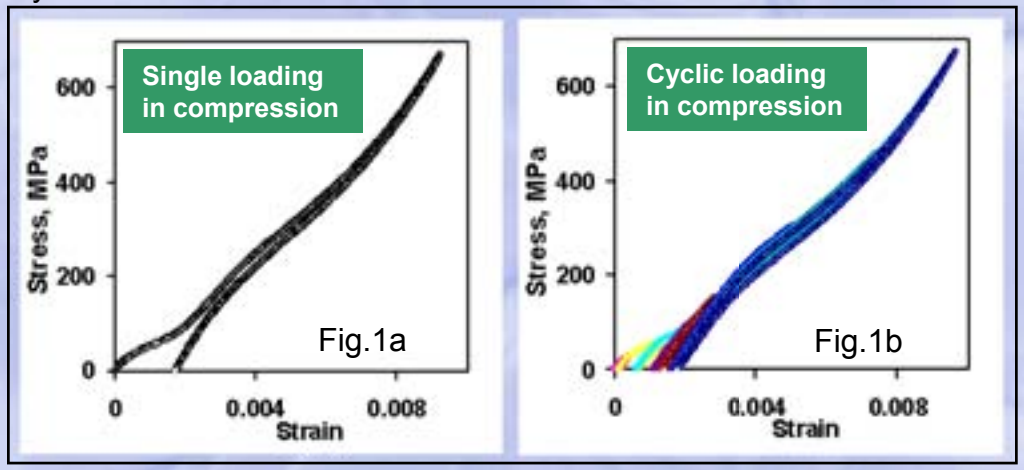
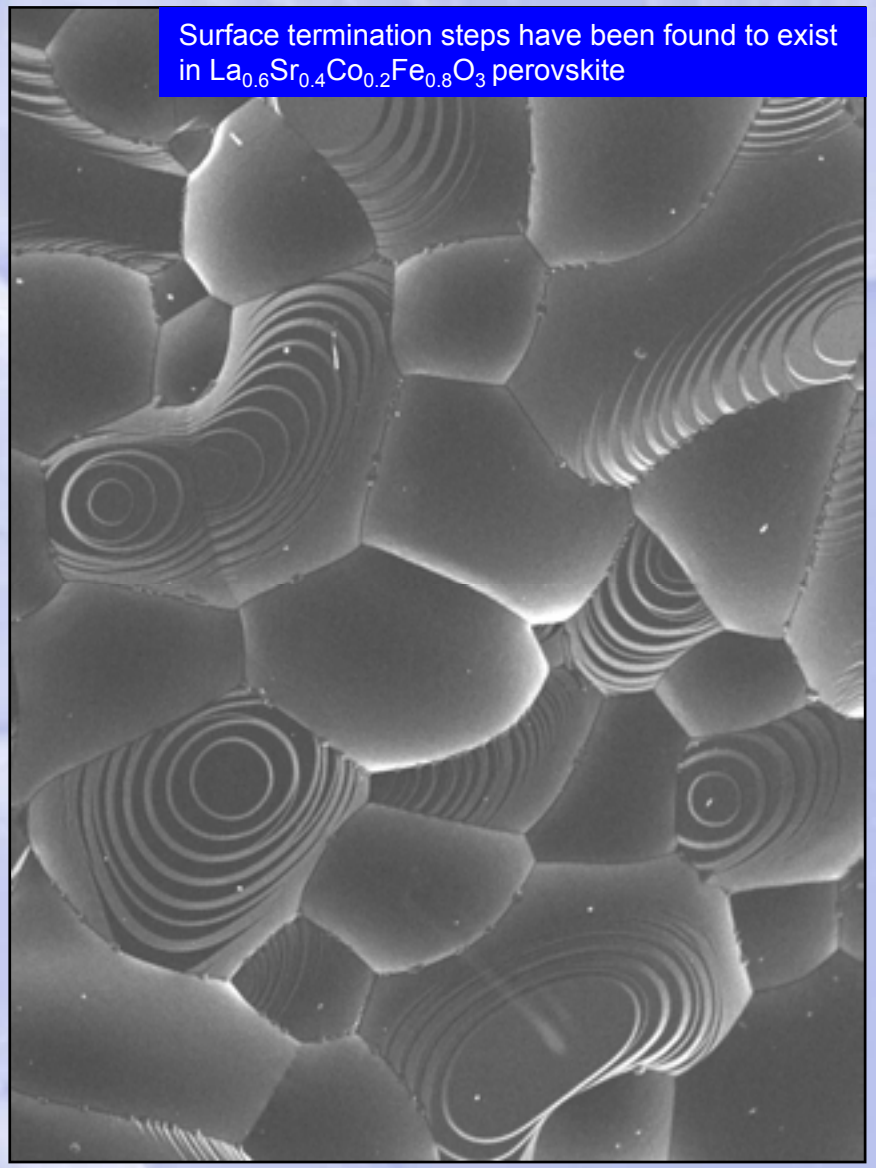
Intellectual merit

The deformation behavior which exhibit two inflection points and respectively two softening/hardening events during the compression testing have been discovered to occur in the orthorhombically distorted $(La_{0.9}Sr_{0.1})_{0.95}Cr_{0.85}Mg_{0.1}Ni_{0.05}O_3$ perovskite (Fig.1a and b). This perovskite exhibits a first order phase transition from the orthorhombic to rhombohedral phase which is a reason why these double softening/hardening events occur.

The room temperature (RT) creep has also been studied for a number of ferroelastic mixed ionic electronic conducting perovskites, such as cobaltites, ferrites, and chromites. It was discovered that the RT creep is a function of the compressive loading. The highest RT creep occurs at the loading corresponding to the stress in the inflection point, while at stresses slightly below or above the inflection point the creep is significantly lower, with no creep occurring at highest load where the deformation is basically elastic with no hysteresis observed.





MTU students presenting the results of their research at the Gordon Research Conference on Solid State Studies in Ceramics, NH, August 2006

Broader Impact

Prof. Nina Orlovskaya and three MTU undergraduate students (Alexandra Zevalkink, Rachel Rosten, and Allen Hunter) participated in the Gordon Research Conference on Solid State Studies in Ceramics that was held in New Hampshire on August 13-18, 2006. The students presented the results they obtained working on their research projects supported by NSF. At the GRC they had an excellent chance to listen to the presentations of the well known scientists, ask questions, and discuss their own research findings. They also delivered short oral presentations describing their research.

This scientific conference gave MTU undergraduates a chance to meet other students from different US universities, and discuss different approaches and methods used in the undergraduate research.
All three of MTU students are very interested to pursue higher degree in the graduate school, and they used this opportunity to discuss what the best US graduate programs offer. Allen Hunter talked to MIT professors from their Department of Materials Science and Engineering and after the GRC meeting he visited MIT laboratories. He considers applying to MIT for the graduate school. Alex Zevalkink also talked to different professors trying to identify the best school for her graduate studies.