NANOMECHANICS OF FUNCTIONAL MATERIALS UNDER STRESS-INDUCED PHASE TRANSFORMATION

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Functional materials that undergo solid-solid phase transformations are widely exploited in various applications such as biomedical devices, microelectronics, caloric cooling, and energy harvesting. In this presentation, I will briefly discuss the continuum mechanics theories used to predict the microstructure formation in these materials, which is crucial to the transformability and fatigue properties under stress-induced phase transformations. To verify the theories, I will demonstrate how to carry out nanomechanical experiments for phase-changing materials, including the focused ion beam techniques for miniaturized sample preparation as well as the ex/in situ nanomechanical tensile and compression tests. I will show that our experimental results validate the underlying mechanics theories and provide valuable insights for designing low-fatigue alloys and multiferroic ceramics.