## 1.5.P06

# Domain wall structure and wall strain

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Stresses and strains within domain walls are important for understanding the interaction of domain walls with point defects, and the surface structure of the domain walls [1,2]. Unfortunately attempts to determine these properties of the domain wall by diffraction or other methods fail because of the low resolution of the technique. We outline a method for estimating local stresses and strains within the domain wall using Landau theories of phase transitions based on elastic data. We apply this method to some reference materials [3].

**References**

[1] Lee W.T., Salje E.K.H., and Bismayer U. (2002) *J. Physics: Condensed Matter* **14**, 7901-7910.
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## 1.5.P07

# Phase transitions and anelasticity in $La_xNd_{1-x}GaO_3$ perovskites

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Results are presented from an experimental study of the phase transitions of $La_xNd_{1-x}GaO_3$, (0.6<x<1). This mineral, with a disordered perovskite structure, is commonly used as a substrate for epitaxy of high-T superconductors. It shows transitions from orthorhombic (*Pnma*) to rhombohedral (*R*3) crystal systems with increasing temperature. X-Ray powder diffraction, Raman Spectroscopy and Dynamic Mechanical Analysis (DMA) methods have been combined in order to investigate the variations in transition temperature, $T_c$, with varying La and Nd proportions.The transition is reversible as a function of temperature.

DMA measurements of $LaGaO_3$ reveal an increase in mechanical loss, tan $\delta$, below $T_c$ for samples held in a 3-point bend arrangement and stressed under small loads at low frequencies, ≤1Hz. This is associated with the development of a ferroelastic twin microstructure in the orthorhombic phase, below 145°C, with domain wall pinning acting as a mechanism for internal friction. $T_c$ for the transition to R3 increases with increasing Nd content, as revealed by spectroscopic and diffraction studies. The results demonstrate that anelasticity due to domain wall motion is significant in orthorhombic perovskites as well as tetragonal and rhombohedral structures, observed earlier by Harrison *et al*, 2003, and Harrison and Redfern, 2002. In view of this, one may anticipate that lower mantle *Pnma* perovskites (e.g. $MgSiO_3$) would show similar anelasticity at depth.

**References**

[1] Harrison *et al*, (2003) *Am. Min.* **88** (4), 574-582.
[2] Harrison and Redfern, 2002 (2002) *PEPI* **134** (3-4)**,** 253-272.