Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Ferroelectricity in $SrTiO_3$ Ceramics and Thin Films Induced by Pr Doping[1] A. DURAN, M. CRUZ, J. HEIRAS, J. SIQUEIROS, Centro de Cincias de la Materia Condensada A.P. 2681-Universidad Nacional Autonoma de Mexico, Ensenada B.C.22800, MEXICO — We have synthesized samples of $Sr_{1-x}Pr_xTiO_3$ with 0<x<0.15. X-ray diffraction (XRD) and XPS spectroscopy revealed that the Pr ion enters substitutionally in the Sr site with mixed valence in a Pr^{+3}/Pr^{+4} = 2:1 ratio. The permittivity measurements show a peak at ∼240 ^{0}C and the polarization measurements display hysteresis loops indicating that the Pr ion induces ferroelectric behavior at room temperature. On the other hand, the ceramic with x=0.025 was used as target to grow thin films by pulsed laser ablation on $Pt/TiO_2/SiO_2/Si$ substrates. XRD analysis shows that the deposited sample grows preferentially along the (111) plane. The hysteresis loop was confirmed in thin films for this composition with remnant polarization almost an order of magnitude higher than that of the ceramic with corresponding composition. The results described above suggest two important facts. i) The ferroelectric-paraelectric transition is very probably due to lattice instability as a consequence of the difference in Sr/Pr ion size leading to an off center displacement of the Ti ion, and ii) the enhancement of the remanent polarization in thin films is an indirect evidence that the polarization axis is along the (111) direction in bulk.

[1]Thanks to CONACyT Project No. 40604- F and DGAPA-UNAM through and IN100903 and IN116703.

Alejandro Duran
CCMC-universidad Nacional Autonoma de Mexico

Date submitted: 24 Nov 2004 Electronic form version 1.4