diffuse scattering or phonon scattering can lead to large effects in the electron diffraction pattern especially near second order phase transition where phonon softening occurs. Additionally, elastic diffuse scattering comes from structural deviations from a periodic lattice [1]. These structural deviations can be defects, partial ordering of otherwise disordered structure or structural fluctuations. By studying diffuse scattering we can obtain information about the crystal imperfections and dynamics which can not be obtained from other characterization methods.
The goal of this study is to characterize, through diffuse scattering in electron diffraction, the structure of defects in the epitaxial layers of perovskite structure and more specifically its influence on the dynamic of the lattice (lattice vibrations, structural fluctuations and continuous phase transition due to phonon softening) [3]. These properties have to be linked with the anomaly of the ferroelectric properties of such thin films. Different strain states can be probed by changing the substrate material or introducing different buffer layers.
The results of STO films deposited on different substrate show different behavior. On STO substrate, at 135K, the superstructure spots in the thin film, have already the same FWHM than the fundamental reflections, indicating a complete phase transition. This shift toward higher transition temperature in thin STO films has already been observed [4]. On LaAlO3 (LAO) substrate, fine peaks appear near 140 K in the diffraction pattern of the film revealing a strain induced phase transition.

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Magnetic and Dielectric Properties of Fe based Langasites. Pierre Bordet[a], Karol Marty[a], Virginie Simonet[a], Mickael Loire[a], Eric Ressouche[b], Rafik Ballou[a], Celine Darie[a], Jakob Kljun[a], Olivier Isnard[a], Bartosz Zawilski[a], Pascal Lejay[a], Charles Simon[c]. [a]*Institut NEEL, CNRS & UJF, Grenoble, France.* [b]*INAC, SPSMS/MDN, CEA, Grenoble, France.* [c]*CRISMAT, CNRS ENSICAEN, Caen, France.*
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We have investigated the magnetic and dielectric properties of the non-centrosymmetric Fe containing langasites of type $A_3BFe_3D_2O_{14}$ with A=Ba, Sr, Ca, B=Ta, Nb, Sb and D=Ge, Si. Using single crystal and powder neutron diffraction, a novel doubly chiral magnetic order was found in these structurally chiral compounds [1], in which the Fe cations form planar triangular lattices of triangle units. The magnetic structure was found to be a helical spin arrangement propagating along the c axis of equal moments lying in the (a,b) plane at 120°from each other within each triangle. This 120°arrangement results from the usual compromise of frustrated Heisenberg spins on a triangle-based lattice. For all the investigated compounds, the magnetic ordering was found remarkably similar, with Tc ~ 25K and a propagation vector τ~ 1/7, except for those having the B site occupied by Sb^{5+}, for which Tc ~ 35K and τ was closer to 1/5. Unpolarized neutron scattering on a single crystal associated with spherical neutron polarimetry proved that a single triangular chirality together with a single helicity was stabilized in a crystallographically enantiopure crystal. A mean-field analysis allowed us to show that the magnetic and structural chiralities are related though a twist in the plane to plane super-superexchange paths. The langasite structure is non-centrosymmetric P321 and a further lowering of symmetry is achieved in the magnetic phase leaving an overall polar structure for which the appearance of a spontaneous electric polarization is allowed. High resolution synchrotron powder diffraction suggests that the magnetic phase transition could be associated to a structural one. Dielectric measurements reveal the presence of magneto-electric coupling through an anomaly at the Néel temperature in the thermal variation of the dielectric permittivity and its quadratic dependence with the magnetic field. The Fe-langasite could then be a new example enlarging the class of magnetoelectric/ multiferroic triangle-based antiferromagnets

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Ferroelectric Ordering of $Cd_2Nb_2O_7$. Thomas Malcherek. *Mineralogie, Universität Hamburg, Germany.*
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The pyrochlore $Cd_2Nb_2O_7$ (CNO) exhibits unusual ferroelectric properties. Similarity to relaxor materials is indicated by a frequency dependence of the dielectric function over a limited temperature range below 200K. Contrary to standard relaxor material, the formation of polar nanoclusters associated with this behaviour has to be explained in the absence of chemical mixing. Heat capacity anomalies have been observed immediately below 204K, at 85K and at 46K [1]. The exact crystal structure of the corresponding ferroelectric low temperature phases has remained largely undetermined because of their strongly pseudo-cubic nature. Recently the low temperature structure of CNO has been explored by all electron ab-initio calculations in the framework of density functional theory [2]. According to this study, CNO distorts to monoclinic symmetry (space group Cc) at low temperatures via an intermediate orthorhombic phase (space group Ima2). The calculated monoclinic low temperature structure is