



## 1 year Post doc position

### Operando Multi-Grain Diffraction in Functional Thin Films

We wish to recruit a Postdoctoral Research Assistant to join the X-Ray group in CEA/Leti – Minatec Institute. We recently have developed advanced synchrotron knowhow to characterize functional thin films during electrical cycling [1,2]. We wish to use sub-micronic synchrotron diffraction to elucidate ferroelectric-domain fluctuation heterogeneities in ferroelectric polycrystals.

The domain switching and the domain wall motions (i.e. extrinsic contribution) play a major role in the electro-mechanical coupling of ferroelectric thin films. For example,  $\text{Pb}(\text{Zr},\text{Ti})\text{O}_3$  (PZT) functional thin films are used in many piezo-MEMS applications integrated in inkjet printheads or haptic screens. Improving their piezoelectric properties (i.e.  $d_{33}$  and  $d_{31}$  coefficients) is highly desirable. To reach this goal, PZT microstructure studies including complex interactions between texture, stress and domain switching need to be addressed. Strong local heterogeneities due to the residual stress are expected in these polycrystalline films affecting overall electrical response.

The goal of the present work is to study morphological evolution and switching behaviors of domains within several tens of single grain during electrical cycles. Laue micro-diffraction and (coherent) sub-micronic diffraction appears very suitable for this purpose. The peaks position, intensity, shape ... will provide numerous information about domain configuration evolution during cycling.

First of all, a special focus on Laue micro-diffraction will be conducted in close collaboration with ESRF-CRG BM32 group [3]. Capabilities, uncertainties (and limitations) of that approach will be investigated. Nano-beam monochromatic or lab-source experiments will also complement Laue findings.

#### Desired skills

Applicants should hold a PhD in physical/engineering/chemical or material science. A strong background in X-Ray diffraction is mandatory. Taste for data analysis, simulation and good skills in scientific programming (Python) is an asset.

#### Keyword

Synchrotron, Laue diffraction, Ferroelectric, Thin Film, In-situ/Operando

#### Contacts

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#### About Appointment and Employer

The post is funded for a period of 1 years in the first instance from April 2016, or as soon as possible thereafter. Further funding to support the vacancy is available. The applicant will conduct synchrotron experiment at ESRF and will have access to CEA-Nano characterization platform for complementary studies.

#### Bibliography

[1] N. Vaxelaire, P. Gergaud, G. Vaughan, J. Appl. Cryst 47, 495-504 (2014)

[2] V. Kovacova, N. Vaxelaire et al Phys. Rev. B 90, 140101 (2014).

[3] O. Ulrich et al Review of Scientific Instruments 82, 033908 (2011)