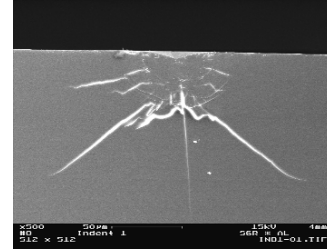


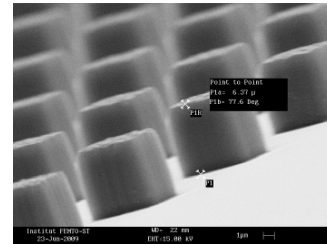
## *Post-Doctoral Position*

### **Plastic deformation of silicate glasses**

Silicate glasses are archetypes of brittle materials. However, below the micrometer scale, they present a plastic response. Dislocation mechanisms being ruled out by the amorphous nature of these materials, a fundamental question is the precise physical mechanisms responsible for plasticity at the molecular scale. In order to provide experimental inputs to test theoretical predictions, we develop methods to identify the constitutive behaviour of amorphous silicates (1). To that aim, mechanical measurements at the micrometric scale have been performed combining Raman microspectroscopy and microindentation. From the residual densification at the micrometric scale, finite element simulations (2, 3) (FEM, coll. G. Kermouche, ENISE) allow for identification of the constitutive law of the material including plasticity.



Here we want to identify key features responsible for the plastic behaviour of silicate glasses. We will focus on the role of the depolymerisation of the silicate matrix by gradual addition of glass modifiers. High temperature fusion is suitable for gradual addition of Na to silica while using the sol-gel technique (4), the water content can be controlled. Raman spectroscopy as well as alternative techniques such as fluorescence will be used for strain measurement purposes and FEM for identification. Beyond indentation simpler geometries such as uni-axial compression (micro-column) and traction (micro dog-bone, coll. F. Mompou, CEMES) will be investigated to better probe respectively the shear and tensile responses of the materials.



- 1) "Raman Microspectroscopic Characterization of Amorphous Silica Plastic Behavior", A. Perriot, D. Vandembroucq, E. Barthel, V. Martinez, L. Grosvalet, Ch. Martinet, and B. Champagnon, J. Am. Ceram. Soc. 89 (2006) 596-601.
- 2) "Mechanical modelling of indentation induced densification of silica", G. Kermouche, E. Barthel, D. Vandembroucq and P. Dubujet, Acta Materialia 56 (2008) 3222-3228.
- 3) "Density hardening plasticity and mechanical aging of silica glass under pressure: A Raman spectroscopic study" Vandembroucq D., Deschamps T., Coussa C., Perriot A., Barthel E., Champagnon B., Martinet C., J. Phys.: Condens. Matter 20 (2008) 485221.
- 4) "Nanolmprint on Silica Sol-gels: a simple route to sequential patterning" Christophe Peroz, Vanessa Chauveau, Etienne Barthel and Elin Sondergard Advanced Materials 21 (2009) 555-558.

### **Profile**

The applicants hold a PhD in material science, in relation to mechanics, surface mechanics or thin films.

### **Details**

The position is for one year starting as soon as a suitable candidate has been found. The salary is dependent upon experience.

The lab is a joint CNRS/Saint-Gobain unit located within one of the major Saint-Gobain research facilities at Aubervilliers, in the north of Paris. It develops strong ties both with industry and academic research.

For further details and applications (cover letter, CV, statement of research interests):

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