# Towards sub-100nm resolution chemical mapping by XRF combined to simultaneous topography

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## Abstract

The aim of our work is to develop new instrumentation providing physical and chemical characterization of individual nanoobjects. For that purpose, we have designed and fabricated a new characterization tool combining X-Ray Spectroscopy and Shear Force Microscopy, working at ambient conditions, allowing surface topography measurement simultaneously to chemical mapping [1,2]. This apparatus is based on the visible luminescence collection of a sample through the microscope probe. However, this apparatus only allows the study of luminescent materials, limited mainly to semiconductors. To extend the use of the technique to a wider range of materials, we want now to collect the X-ray Fluorescence instead of the visible luminescence during SFM scan, in a similar concept, as shown in Fig. 1.
An incident X-ray beam laterally irradiates a sample which emits XRF collected through an X-ray monocapillary and analyzed by an EDX detector. Approached in near-field mechanical interaction with the surface and vibrating thanks to a quartz tuning fork, its apex can be used as a probe of a shear-force microscope head. This equipment is thus able to combine simultaneous chemical mapping and topography of a sample.
For that purpose, we have designed a test-bed to show the feasibility of this project. Experiments achieved with a 10 µm diameter X-ray capillary used for detection carried out with an in-lab microfocused source show high signal to noise ratio. Extrapolation of signal intensity that can be expected if the capillary used is shrunk to 1 µm and indicate that the concept is realistic in lab, and that sub 100 nm lateral resolution is achievable in synchrotron environment.

## References

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[2] M. Dehlinger, C. Dorczynski, C. Fauquet, , F. Jandard, A. Bjeoumikhov, S. Bjeoumikhova, R. Gubzhokov, A. Erko, I. Zizak, D. Pailharey, S. Ferrero, B. Dahmani, D. Tonneau,
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## Figure

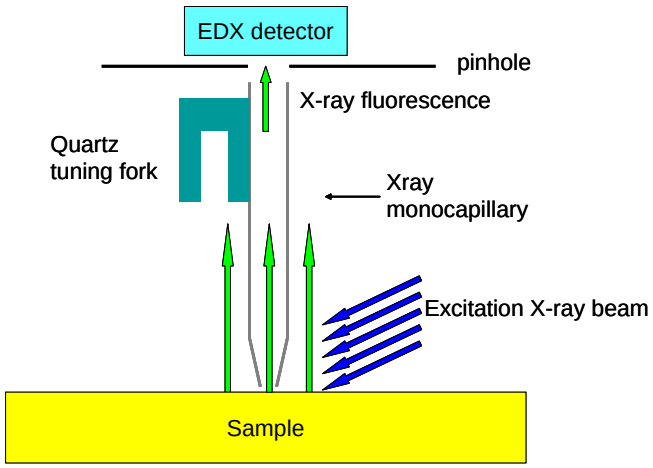


Figure 1: Scheme of the instrument principle designed to simultaneous collect XRF and topography, based on a Shear-Force Microscope