

<b>ESRF</b>	<b>Experiment title:</b> Microfluorescence of Au and Pb fluid inclusions	<b>Experiment number:</b> CH475
<b>Beamline:</b>	<b>Date of experiment:</b> from: 17/04/98 to:	<b>Date of report:</b> 3 1/08/98
<b>Shifts:</b>	<b>Local contact(s):</b> Simionovici A., Drakopoulos M.	<b>Received at ESRF:</b> <b>01 SEP. 1998</b>

**Names and affiliations of applicants** (\* indicates experimentalists):

Philippot Pascal\*, CNRS - Universite Paris 7

MéneZ Bénédicté\*, Universite Paris 7

Drakopoulos Michael\*, ESRF

Simionovici Alexandre\*, ESRF

Snigirev Anatoly, ESRF

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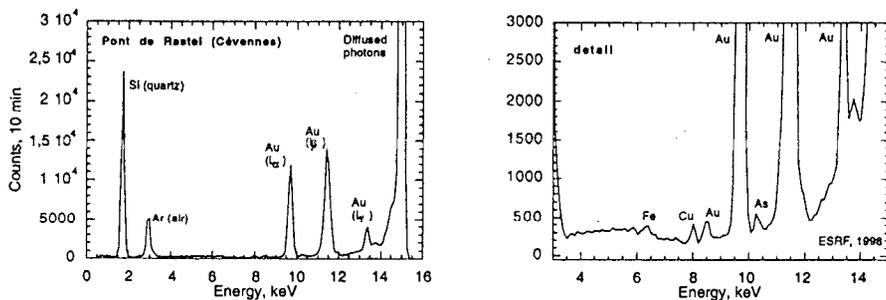
### **Report:**

The aim of experiment CH-475 performed at ESRF on beamline ID22 during April 1998 was to dose trace metals of economic interest such as Gold trapped in microscopic (20-50  $\mu\text{m}$ ) individual fluid inclusions and to perform 2-D maps of element distribution with high sensitivity (below 1 ppm) and high spatial resolution (few microns).

This experiment was a continuation of an experiment performed on beamline ID 22 during July 97; while still in commissioning (see report of experiment CH-223). At the time the report of CH-223 experiment was written, most of the results were still under treatment and we were not able to confirm or infer that the correction procedure developed by Philippot et al. (1998) could provide reliable quantitative analysis. The results of this experiment, which confirm that concentration estimates of trace metals in fluid inclusion is **possible- using** highly intense synchrotron source, have been presented in 3 international meetings (MéneZ et al., 1998a, b; Philippot et al., 1997, 1998 a, b) and should be published in a **special issue of Chemical Geology current 1999** (Philippot et al., 1999). During experiment CH-223, the limit of detection was of the order of 100 ppm for trace metal **such as arsenic**. This value is far from the expected ppm level required for Au dosage. During experiment CH-475, the use of a Fresnel zone plate ensured focusing of **monochromatized X-rays** at about 15 keV (photon energy just above the absorption edge of gold), with a spatial resolution of 2x8  $\mu\text{m}$  and a flux of  $10^{10}$  ph/sec. The fluid inclusion studied are from natural quartz-bearing rocks collected in different gold deposit (France, Portugal, Switzerland, Columbia and Brasil).

The figure below shows a X-ray spectrum obtained for a 10 min acquisition time on a single fluid inclusion from the Pont-de-Rastel gold deposit, France. This is the only spectrum showing Au X-ray peaks we were able to obtain from this sample and among all other samples analyzed. This suggests either that the analysis correspond to a micro-grain of gold trapped within the inclusion or in the host quartz but at a different depth below the fluid inclusion, or that we were not able to identify with certainty the population of fluid inclusions containing gold in solution. No gold inclusion has been identified in the fluid inclusion or the host mineral using an optical microscope. In order to determine if the gold signal could correspond to a grain of gold (yet invisible by optical means) two orthogonal scans and a 2D map were performed across and above the inclusion. Results of this investigation clearly indicate that the counting rate was maximum above the inclusion, thus arguing that the gold is present within the inclusion.

The results presented above were obtained on April 20 during the afternoon and we thus lacked time to investigate in greater detail other samples. Although very promising, the results need to be reproduced before any definite conclusions can be drawn.



## References

- Ménez B., Philippot P., Mosbah M., Drakopoulos M., and Snigirev A. (1998a) ICNMTA 98, 1 I-16 October, 1998, Cape Town, South Africa, in press.
- MCnez B., Philippot P., Vanko D., Mosbah M., Chevalier P., Drakopoulos M., Populus P., and Snigirev A. (1998b). PACROR VII Meeting, 1-4 June, Las Vegas, p. 44
- Philippot P., Menez B., Drakopoulos M., Snigirev A. Chevallier P., Gibert F., Legrand F., and Populus P. (1997). 50th Synchrotron Anniversary, ESRF, Nov. 97, Grenoble
- Philippot P., MCnez B., Chevallerier P., Gibert F., Legrand F., and Populus P. (1998a). *Chem. Geol.* 144, 99-119.
- Philippot P., Menez B., Drakopoulos M., and Snigirev A. (1998b) ICNMTA 98, 1 I-16 October, 1998, Cape Town, South Africa, in press
- Philippot P., MCnez B., Drakopoulos M., and Snigirev A. (1998c) PACROFI VII Meeting, 1-4 June, Las Vegas, p.49.
- Philippot P., Ménez B., Drakopoulos M., and Snigirev A. (1999). Submitted to *Chem. Geol.*