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Experiment Report Form

The double page inside this form is to be filled in by all users or groups of users who have had access to beam time for measurements at the ESRF. This double-page report will be reduced by ESRF to a one page, A4 format, and will be published in the Annex to the ESRF Annual Report.
Should you wish to make more general comments on the experiment, enclose these on a separate sheet, and send both the Report and comments to the User Office.

When preparing your report, please follow the instructions below:
• fill in a separate form for each project or series of measurements.
• type your report, in English.
• make sure the report does not exceed the space available; tables and figures may be included if you wish.
• for work which is published or which is in press, you may simply include a copy of the abstract together with full reference details. If the abstract is in a language other than English, ensure that you include an English translation.
• bear in mind that the report will be reduced to 71% of its original size. A type-face such as “Times”, 14 points, with a 1.5 line spacing between lines for the text produces a report which can be read easily.

Note that requests for further beam time must always be accompanied by a report on previous measurements.

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ESRF	**Experiment title: High Resolution Microprobe Analysis of Fluid Inclusions: Gold and Uranium dosage**	**Experiment number**: CH-626
Beamline: ID22	**Date of experiment**: from: 6-5-99 to: 11-5-99	**Date of report**: 25-7-99
Shifts: 6	**Local contact(s)**: A. Simionovici et A. Snigirev	*Received at ESRF:*

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Report:

The aim of experiment CH-626 was to dose U and Au in single fluid inclusion (micro-cavities 10 to 50 micrometers containing a fluid phase responsible for the transport and concentration of matter in the Earth's Crust). Dosage of gold was a continuation of a previous experiment (CH-475 performed in April 98) during which we obtained a markedly defined Au peak from a fluid inclusion from the Pont-de-Rastel deposit. We aimed at confirming this fundamental result in a variety of other Au-deposit from Australia, USA and Morocco, which contain one of the most important Au-deposit worlwilde. Dosage of U was a new project, with important implications on radioactive waste disposal and U-deposit exploration.

Gold :

We were not able to find gold in any of the sample investigated. Performing a 2D map of the fluid inclusion from Pont-De-Rastel that contained gold, we showed that gold was markedly localised in the fluid inclusion and could not be representative of a specy in solution, rather as a minute gold grain (less than 1 micron in size) that was impossible to visualize using an optical microscope. Nevertheless, in all samples investigated we were able to dose a variety of trace metals such as Cu, Zn, Sr, Rb, Ba, Ti, Br...; it is the first time that such elements are founds in individual inclusions. These results can be considered as representative of a state-of-the-art analytical development. In addition,

recognition that the gold grain was trapped in a first generation fluid population indicated that gold deposition occurred during an early stage of the hydrothermal history of the Pont-de-Rastel deposit, an observation in marked opposition with most models proposed for the generation of Au-deposit during variscan age (about 300 Million years) in Europe...

Uranium:
3 samples collected among the most important U-deposit worlwilde were analyzed for their U in solution in individual fluid inclusion. These are: Streltsovka deposit (Russia), Caramal deposit (Australia) and Oklo deposit (Gabon). (I remind here that although we know how to found U- and Au- deposit on the basis of empirical observations, we do not understand the mechanisms by which trace metals transported and concentrated through the crust.)
In one of the sample from Russia, we found U, Zr, Sr, Rb, Pb, La in solution (confirmed by 2D maps, Figure 1 and see also Figure 1 of the attached Proposition form). This finding is of major importance and as tremendeous environmental, energetic and economic implications (Zr, Sr and Pb all form as fission product of U). Perhaps more important is that in one of the spectrum we suspect the presence of I and Cs in small amounts (see figure 1 of the experiment proposal attached). Isotopes of both elements form as fission product of U, and are of great environmental concern.

Figure 1