Europlanet TNA Report

PROJECT LEADER

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COLLABORATORS

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Date of TNA visit:	July, 23-27 2012 Analyses performed on July, 24-26 2012
Host laboratory:	Centre de Recherches Pétrographiques et Géochimiques

Project Title – **Dating U-rich heterogenite (CoOOH) from the Katanga Copperbelt: new insights into the U deposit genesis**

- Report on the outcomes of the TNA visit (approx 1 page)

Scientific Report Summary

The Katanga Copperbelt (DRCongo) hosts world-class cobalt deposits and numerous uranium showings. Despite their economic significance, little was known about the timing of the uranium and cobalt mineralization events (Decrée et al., 2010; Decrée et al., 2011a; Decrée et al., 2011b). New U-Pb analyses were performed onto 5 uranium-rich heterogenite (CoOOH) samples from the Shinkolobwe mine, using the IMS-1270 at the CRPG. Two Neoproterozoic ages - at ~830 Ma and at ~ 670 Ma - were obtained. They are consistent with the ages previously obtained onto similar material (Decrée et al., 2011a). Since the geological contexts prevailing in the determined time frames were not favorable for heterogenite formation (and/or preservation), these ages are regarded as being relevant to U deposition and cycling, rather than to heterogenite formation. In that way, (1) the ~830 Ma age should be connected with the syndiagenetic deposition of uranium in the Copperbelt; and (2) the ~670 Ma age is seemingly related to an increase of the geothermal gradient in the area, leading to fluid circulations and the subsequent re-concentration of metals, of which uranium.

Full Scientific Report on the outcome of your TNA visit

In order to further investigate U cycling and U deposit development in the Katanga Copperbelt, 5 heterogenite samples from the Shinkolobwe mine were selected for U-Pb analyses. The latter were performed using the IMS-1270 at the CRPG, during three days (July 24-26, 2012).

More precisely, thirteen measurements performed onto one heterogenite sample define a discordia line with an upper concordia intercept at 838.6 ± 4.2 Ma. This age is consistent with the corresponding 207Pb/206Pb ages (from 829±2 Ma to 851±2 Ma). These new data, together with the previously obtained heterogenite U-Pb analyses (Decrée et al., 2011a), allow determining an age of 833 ± 3 Ma. This age seemingly confirms the early syndiagenetic concentration of uranium in the Katanga Copperbelt, which has already been suggested by several authors (Cailteux, 1997 and references therein). The ~830 Ma age, together with new geodynamic concepts and geological data relating to the study area, allows for an improved assessment of potential U sources in Katanga.

The second range of age - 685 ± 7.4 Ma, 653.5 ± 4 Ma and 638.6 ± 8.9 Ma - is provided by 30 measured isotopic ratios obtained on 3 heterogenites. The ages are deduced from the upper concordia-discordia intercepts. For these samples also, the U-Pb ages are consistent with the corresponding 207Pb/206Pb ages. When these new data are compiled with the first set of U-Pb analyses performed onto U-rich heterogenites (Decrée et al., 2011a), they allow determining an age of 667 ± 5 Ma. This age is similar to those obtained onto uraninite in the same deposits (at ~652 Ma; Decrée et al., 2011b). An overlapping of the uraninite and heterogenite ages is actually observed in the 207Pb/206Pb age density diagrams; it suggests that these ages are indicative of a same event, relating to the U mineralization. The mobilization and re-concentration of uranium at the time would be linked to hot fluid circulation, in connection with a progressive increase in the geothermal gradient, during the Nguba rifting event (Kampunzu et al., 1991; Kampunzu et al., 2009).

Unfortunately, due to the high amount of common Pb in the last sample, the acquired U-Pb data are useless to investigate U cycling.

References. Cailteux (1997), In: Charlet, J.-M. (Ed.), Colloque International Cornet, Gisements stratiformes de cuivre et minéralisations associées, Mons. Académie Royale des Sciences d'Outre-Mer, 245–268. Decrée et al. (2010), Mineralium Deposita 45, 621-629. Decrée et al. (2011a), Mineralogical Magazine 75 (3), p. 733A. Decrée et al. (2011b), Ore Geology Reviews 40, 81-89. Kampunzu et al. (1991), Tectonophysics 190, 363–371. Kampunzu et al. (2009), Ore Geology Reviews 35, 263-297.

- Publications arising/planned (include conference abstracts etc)

- Abstract conference for the Geologica Belgica meeting (September 2012, Brussels)
- Submission of a manuscript to Precambrian Research or Mineralium Deposita planned in October 2012
- Abstract conference for the SGA meeting (August 2013, Uppsala)

- Host approval

The host is required to approve the report agreeing it is an accurate account of the research performed.

The report by Sophie Decré of her visit to CRPG ion probe device describes accurately the results obtained on the different samples studied. I main just add that the ion probe measurements were calibrated against the CRPG uraninite reference material, with results in good agreement with the U and Pb contents measured by EMP before.

Etienne Deloule, CRPG-CNRS.