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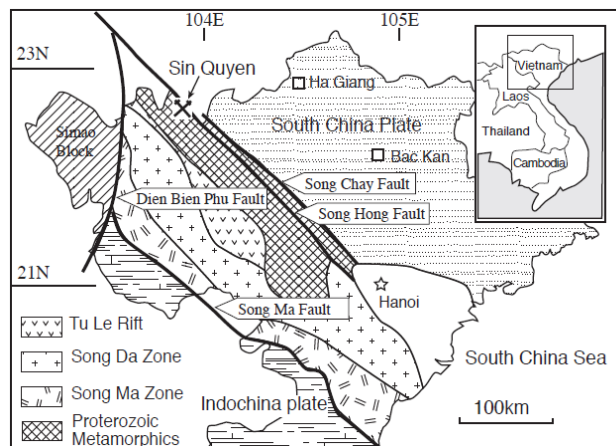
Timing of the IOCG mineralization in Sin Quyen deposit in North Vietnam

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The IOCG Sin Quyen deposit is localized at the Lao Cai province in the North Vietnam (Fig. 1). The deposit is hosted by altered amphibolite and biotite gneiss located in the metamorphosed sediments of Proterozoic Sin Quyen Formation, which fulfill the wide Red River regional fault. The deposit is several tens meters wide, trending toward in NW-SE direction [1]. The major orebodies are composed of chalcopyrite and magnetite forming lens shape bodies composed of pyroxene, allanite, epidote, biotite, titanite, and some quartz in altered sequence of the Sin Quyen Formation. Apart from magnetite and chalcopyrite, the following minerals have been recognized: pyrite, pyrrotite, sphalerite, tennantite, cubanite, arsenopyrite, galena, Bi-native, bismuthinite, Au-native, and tellurides.



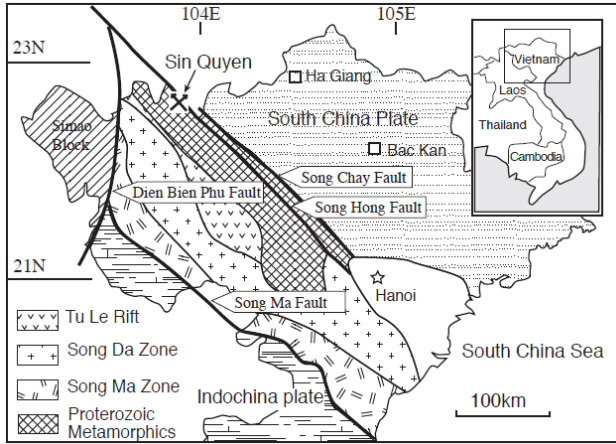


Fig. 1. Geological sketch and localization of IOCG Sin Quyen deposit follow Ishihara et al. (2011)

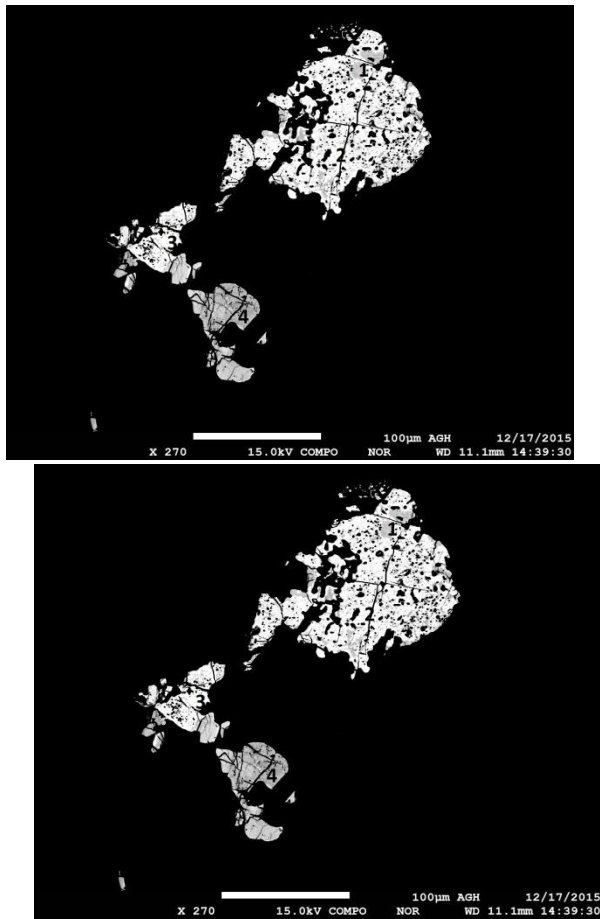


Fig. 2. SEM-BSE image of two different uraninites, 1-4- no of WDS analytical points

The investigated samples are rich in the rare earth elements (REE) and the concentrations of these ranges from 10s to above 5400 ppm, and the concentration of uranium reaches 80 ppm [2]. Uraninite crystals have been found in the samples representing copper-iron massive ores. Uraninites are inhomogeneous in both optical properties and chemical composition. Inhomogeneity of uraninites is also confirmed by two different age determinations, using Jeol 8230 Super Probe. The uraninites with high REE content are older (Fig. 2, p1, p4), and with low REE content are much younger (Fig. 2, p2, p3). The absolute age of these uraninites was calculated as 458-522 Ma (500 Ma average, for $n = 36$ and $\delta = 33$ Ma) and as 82-78 Ma, respectively.

Based on uraninite dating two stages of mineralization are proposed for this deposit. The major stage is related to the skarn-metasomatic alteration, the younger stage was associated with late Cretaceous-Paleocene (82-42 Ma) tectonic activity. Weathering was recognized as the final stage in evolution of the deposit.

References:

[1] Ishihara S et al. (2011) Bulletin of the Geol. Surv. of Japan 62 (5/6): 197 - 209

[2] Pieczonka J et al. (2015) In Viet-Pol 2015 international conference in Earth Sciences: 331-353

