

## Enrichment and Modes of Occurrence of Rare Earth Elements in Weathered Granites in Northern Vietnam

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Wu et al. (1992) showed that REE are adsorbed on the surface of clay minerals in deposit called ion-adsorption type, which are found in Longnan, southeast China. The maximum concentration of the REE in the deposit that occur in weathered crust of granite is 886 ppm which is about 2.5 times larger than that of unweathered host granite. Besides, ion-adsorption type REE can be recovered by acid leaching without grinding and smelting. But its mechanism is not fully understood.

In a town of Dai Tu, Thai Nguyen district in northern Vietnam, Tiberon Co. discovered a significant tungsten deposit as the result of the exploration from 1997. The ore of the Nui Phao deposit has a feature of skarn and greizen mineralization at the contact between Paleozoic sediments and two granitic bodies, Da Lien Granite (DLG) and Nui Phao Granite (NPG). DLG is leucocratic granite in which muscovite and biotite are coexisting. NPG is melanocratic coarse-grained biotite granite. We collected 143 samples systematically from the weathered crust of NPG, which was proven to have high enrichment factor of REE contents compared to that of DLG (Oomura, 2007).

The pulverized samples from different outcrops in a wide area of NPG were analyzed by ICP-MS and XRD in order to inspect their elements and mineral compositions. And by stepwise leaching test, we can determine the volume of ion-exchangeable REEs. REE-bearing minerals in hard rock samples are observed under FE-SEM (Field emission scanning electron microscope) and analyzed its chemical composition with SEM-EDS (energy dispersive spectroscopy).

Total REE concentration is generally high in the northern part of NPG body (Ave. 549 ppm) and ion-exchangeable REEs in the northern part of NPG is also generally high (Ave. 84 % of all REEs). The concentration of REEs in the other part of NPG is around 300 ppm which is only two times higher than that of the fresh core sample of NPG.

By observing with FE-SEM, we discovered we found several types of REE-bearing mineral and one of them in the sample of the north of NPG is secondary hydrous phosphate and covers a wide area. Therefore, it is presumed that the high concentration in the north is due to the influence of hydrothermal mineralization of REE possibly from DLG. This hypothesis is supported by an observation that weathered granites of NPG are characterized by quartz veins.

Keywords: Rare Earth Elements, ion-adsorption type REE