

## Metamorphosed bauxites from the Red River Shear zone, northern Vietnam: inferences and geological significance

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Aluminous metamorphic rocks from the Red River Shear zone in northern Vietnam were investigated in this study. The shear zone has abundant pelitic rocks that have been formed under sillimanite-grade metamorphic condition at the Paleogene period. The aluminous rocks are mainly divided into high-grade (garnet-sillimanite-corundum, garnet-sillimanite-spinel, garnet-corundum-spinel rocks) and low-grade (kyanite-corundum-hematite-phengite rock) rocks and both types show similar whole rock chemical composition with basaltic to andesitic bauxites. Detailed petrographical observations, the high-grade metamorphosed bauxites have experienced prograde stage more than 2.0 GPa at 800 C (based on the assemblage of staurolite + kyanite + rutile + siderite in garnet). The low-grade bauxite preserves the peak condition at 500 C and pressure more than 1.2 GPa (based on the assemblage of hematite + corundum + rutile + phengite + allanite + chloritoid + kyanite in the matrix). Because bauxite commonly formed at the surface on the continent, such high-pressure metamorphic conditions from the metamorphosed bauxites suggest continent-continent collision and its subduction.

Zircon grains in garnet-sillimanite-corundum rock show several U-Pb ages from 265 Ma to 36 Ma may due to the loss of Pb during shearing and/or thermal event at the Paleogene time. However, dark luminescent zircon cores show concordia age of 257 +/- 8 Ma. The zircon cores contain CO<sub>2</sub> rich fluid inclusions and the density is similar to other CO<sub>2</sub> rich fluid inclusions trapped in garnet, corundum, and staurolite. Therefore, we conclude that the high-pressure metamorphism has occurred at the Late Permian that should have strong relation to continental collision between the Indochina and South China cratons.

Keywords: metamorphosed bauxite, continental collision, Red River Shear zone, Vietnam