Composition, coexistence and their geological signifance of amphiboles in the metamorphic rocks, Southern Dabie Mountain, China

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Dabie-Sulu orogen contains the most extensive ultra-high pressure metamorphic terrane in the world. Previous research works have been predominantly focused on the UHP metamorphism while the post-UHP geological processes are regarded as a secondary role.

Amphibole occurs as a very common mineral phase in the retrograded UHP rocks. Their composition and occurence can provide valuable clues on geological processes.

The Bixiling complex is the largest coesite-bearing UHP metamorphic mafic-ultramafic body in the Dabie-Sulu orogen. In the Bixiling area, there occurred meta-ultramafic rocks, MgAl-rich eclogites, FeTi-rich eclogites, amphibolites and granitic gneisses. Geochemical and petrological studies have disclosed that the protoliths of the meta-ultramafic rocks and MgAl-rich eclogites should be a magmatic complex with a magma chamber differentiation characteristics.

In the MgAl-rich eclogites, pseudomorphy of lawsonite (epidote+kyanite+quartz) can be found as intergranular mineral assemblage between garnet and omphacite. Only one stage of amphibole, with a barroisite composition, occurred in this rock.

Field observation and chemical data indicate the amphibolites, which occurred as layers or lens in the granitic gneiss, could be products of complete retrogression from FeTi-rich eclogites. Two stages of amphiboles, ferropargasite and pargasite respectively, occurred in the FeTi-rich eclogites.

A typical migmatite outcrop was observed near the northeastern end of the complex along the Xiannü River. The migmatites consist of fine-grained amphibolites and trondhjemitic gneisses. Both rocks present plastic outlines with a later coherent foliation. Two stages of amphiboles, with concordant composition for each stage, were found in both rocks. They are actinolite in the earlier stage and hastingsite in the later stage. The similarity in amphibole compositions reflects possible chemical equilibrium during the partial melting process.