# Metamorphic textural evolution from mafic granulite to amphibolite in Oki-Dogo Island, Shimane prefecture

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The Paleoproterozoic and Permo-Triassic orogeneses are important in the crustal evolution of East Asia. The Oki metamorphic rocks (Oki-Dogo Island in the Sea of Japan) underwent crustal metamorphism during the Paleoproterozoic (1.85 Ga) and Permo-Triassic (Cho et al., 2021; Kawabata et al., 2022). To infer the tectonic setting of these two events, it is important to reconstruct pressure (P)-temperature (T) history. The Oki metamorphic rocks are mainly composed of pelitic-psammitic gneisses, which contain lenses of mafic metamorphic rocks such as mafic granulite and amphibolite (Hoshino, 1979). Here we present petrological data of mafic granulite, amphibolitized granulite, and newly discovered garnet-bearing amphibolite in the Oki-Dogo Island.
The granoblastic texture of mafic granulite defines the earliest assemblage clinopyroxene + orthopyroxene + brown amphibole (Ti-rich pargasite/hornblende) + plagioclase + biotite. In amphibolitized samples, pyroxenes are replaced by symplectites composed of pale-green amphibole (hornblende/actinolite) + Fe-Mg amphibole + quartz. Further, blue-green amphibole (hornblende/tschermakite) appears along the margin of the symplectites in contact with plagioclase. In some samples, coronitic garnet enclosing mafic minerals (Fe-Mg amphibole partially replaced by blue-green hornblende + chlorite) occurs in contact with plagioclase. Other than coronitic garnet, euhedral garnet is present in well-equilibrated samples. Garnet contains inclusions of blue-green hornblende/tschermakite, Fe-Mg amphibole, plagioclase (An > 90%) and no pyroxene.
Based on the microstructural relation, the metamorphic history can be summarized as 1) garnet-absent granulite facies equilibration and subsequent retrograde metamorphism (symplectite formation in amphibolite to greenschist facies), and 2) the prograde amphibolite-facies metamorphism that formed garnet. Equilibrium conditions of the granulite stage are estimated to be ~800℃ and ~0.6 GPa based on geothermobarometry and pseudosection analysis. Garnet formation conditions during the prograde amphibolite stage are estimated to be 0.56-0.57 GPa and 570-590˚C based on pseudosection analysis. These two metamorphic cycles probably correspond to the Paleoproterozoic and Permo-Triassic events. However, the low-P granulite facies metamorphism of the mafic metamorphic rocks differs significantly from the conditions of the Paleoproterozoic high-P granulite facies conditions estimated by Kawabata et al. (2022) from pelitic gneiss. Since the presence or absence of high-P granulite facies stage (crust thickening) is critical in tectonic implications, it is necessary to carefully consider whether there were higher pressure stages before the low-P granulite facies equilibration.

Cho et al. (2021) Lithos, 396-397, 106217.
Hoshino (1979) Petr. Econ Geol., 74, 87-99.
Kawabata et al. (2022) J. Metam. Geol., 40, 257–286.

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