Petrological implications of a new occurrence of retrogressed eclogite from the Sanbagawa belt of southwest Japan

*Tomoki Taguchi[1], Shunsuke Endo[2], Yohei Igami[1,3], Akira Miyake[1]

1. Graduate School of Science, Kyoto University, 2. Interdisciplinary Faculty of Science and Engineering, Shimane University, 3. Institute of Materials and Systems for Sustainability, Nagoya University

The Sanbagawa belt is one of the most famous subduction-related high-pressure (HP) metamorphic belts in the world, and the metamorphic facies series of the belt reaches the eclogite facies. Sanbagawa eclogites are found within coarse-grained mafic-ultramafic masses (Iratsu type) and their surrounding fine-grained mafic, pelitic, and siliceous schists (Seba type) in central and eastern Shikoku, southwest, Japan (Aoya & Endo, 2017 JGSJ). However, the regional extent of the eclogite facies region (eclogite unit) has not yet been established because most were overprinted by lower-pressure assemblages during the exhumation stage. In order to document the eclogite facies metamorphic features of the belt, we recently conducted comprehensive petrological studies of the pelitic schists in the Asemi-gawa region of central Shikoku (Taguchi & Enami, 2014a, 2014b JMPS; Taguchi et al., 2019 JMG). Our previous studies have revealed that a new eclogite unit exists in a limited high-grade area of this region and is composed primarily of pelitic schists. A number of petrological studies have been conducted on the mafic lithology of this region (e.g. Otsuki & Banno, 1990 JMG; Aoki et al. 2009 Lithos; Uno et al., 2015 CMP). However, none of these works recognize the presence of a definitive eclogitic indicator (omphacite, jadeite) within the mafic lithologies, which contrasts with the other eclogite units of Shikoku. This hinders the reliable reconstruction of the extent of the eclogite facies metamorphism in the Sanbagawa belt. Based on an integrated petrological and mineralogical approach, this study reports that mafic schist with garnet + omphacite + quartz paragenesis was first discovered in the Asemi-gawa region. The mafic schist occurs as thin layers within pelitic schist of the albite–biotite zone. This rock includes abundant garnet porphyroblasts up to 5 mm in diameter and shows prograde-type compositional zoning with no textural or compositional break. Omphacite in the mafic schist only occurs as inclusions in garnet, and albite is the major Na phase in the matrix, suggesting that the mafic schist represents highly retrogressed eclogite. The omphacite in the sample displays a strong Raman peak at 678 cm^{-1}, and concomitant Raman peaks are all consistent with those of the reference omphacite Raman spectrum. Transmission electron microscopy (TEM) observations showed that the selected area electron diffraction pattern of the omphacite is compatible with the common *P*2/*n* omphacite structure. The combination of Raman geothermobarometries and conventional thermodynamic calculations gives peak (pressure–temperature) *P*–*T* conditions of 1.7–2.0 GPa and 440–540 ˚C for the mafic schist. The peak *P*–*T* values are comparable to those of the schistose eclogitic rocks (Seba type) in other Sanbagawa eclogite units of Shikoku. These findings suggest that most of the schistose eclogites and associated metasedimentary rocks along the Sanbagawa subduction zone probably share similar simple *P*–*T* histories.

Keywords: eclogite, FIB–TEM, omphacite, Raman spectroscopy, Sanbagawa belt

