

Preliminary results of the CM Raman geothermometry of the Kebara Formation and the proximal areas in the Kii Peninsula

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The Outer Zone of Southwest Japan in the Kii Peninsula is composed of the Sanbagawa metamorphic belt, the Mikabu belt, the Chichibu belt, the Kurosegawa belt, and the Shimanto belt from the north to the south (Kurimoto, 1986). In the Shimizu-Misato area of the Wakayama prefecture, components of above-mentioned five belts are exposed and the Mikabu belt disappears in the eastern part, where the Kebara Formation is exposed between the Sanbagawa metamorphic belt and the Chichibu belt. One of petrologic characteristics of the Kebara Formation is a common occurrence of lawsonite in both meta-mafic rocks and metapelites (Hada, 1967; Kurimoto, 1986; Tomiyoshi & Takasu, 2009), although surrounding geological units are free from lawsonite. Therefore, the attribution of the Kebara Formation is a lasting question for the researchers of the Kii Peninsula. Since thermodynamic approach for the low-grade metamorphic rocks has some difficulties, we applied carbonaceous material (CM-) Raman geothermometer for the metapelitic rocks of the Shimizu-Misato area including the Kebara Formation, Mikabu belt, Sanbagawa belt, Chichibu belt, and Shimanto belt, following the procedure of Kouketsu et al. (2014), which is developed for the low-grade metamorphic rocks covering 165-400 deg. C. We obtained a mean temperature of 318 deg. C for the Kebara Formation, which is comparable with that of the neighboring unit of the Mikabu belt (320 deg. C). On the other hand, the Sanbagawa belt of the Shimizu-Misato area shows the average temperature of 291 deg. C, which is slightly but evidently lower value within an apparent distance of a few kilometers. Temperatures obtained from the Chichibu belt of the relevant area yields about 283 deg. C, and the Shimanto area does the lowest of 212 deg. C. The estimated temperature of the Kebara Formation is equivalent to that of the Sanbagawa belt of the Ise area, eastern Kii Peninsula (316 +/- 5 deg. C: Ueno, 2001), which shows a gap with that of the Sanbagawa metamorphic belt of the Shimizu-Misato area. This temperature gap suggests that the Kebara Formation and the Sanbagawa metamorphic belt of the Shimizu-Misato area are not a coherent unit but in tectonic contact with each other. This fact is also suggested by the geochronological data: K-Ar/Ar-Ar age data of the Kebara Formation have a range of 103-89 Ma (Isozaki et al., 1992; Kurimoto, 1993; de Jong et al., 2000) while those in the Sanbagawa metamorphic belt of the Shimizu-Misato area mostly range 85-72 Ma with a few exceptions (Kurimoto, 1993; Kurimoto, 1995; Kurimoto, 2013). Compared to the Sanbagawa metamorphic belt in the study area, the metamorphic temperature and geochronological data of the Kebara Formation is similar to the Mikabu belt. The similarity in the CM-Raman geothermometry in addition to the previously investigated geochronological data possibly suggest that the Kebara Formation is correlated with the Mikabu belt.

Keywords: carbonaceous material Raman geothermometer, the Kebara Formation, the Sanbagawa belt, the Mikabu belt