

Handling of the data obtained by quartz Raman barometry

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Quartz Raman barometry are used to constrain the metamorphic conditions under which quartz is incorporated into host minerals by Raman spectroscopic analysis of quartz inclusions in host minerals such as garnet and measuring the residual pressure from the peak shift. Quartz Raman barometer have been used to constrain metamorphic conditions by interpreting the quartz that retains the highest residual pressure value as having been incorporated under the peak metamorphic conditions after several data points have been acquired. In reality, however, the residual pressure of quartz inclusions has a wide range of values and may contain a variety of information other than the highest value. In this study, the residual pressure data obtained by the author are used as a basis for the verification of the handling method of the measured data. The quartz inclusions in eclogite collected at Jenner Beach in the Franciscan complex show residual pressure values of 0.15-0.70 GPa, and histograms show a normal distribution with a mean value of 0.51 GPa. On the other hand, when the quartz-containing area was divided into the core, mantle, and rim of the garnet, the mean residual pressure values increased from the core to the rim, with values of 0.43 GPa, 0.54 GPa, and 0.58 GPa, respectively. This result suggests the possibility of clarifying the growth path of prograde not only by integrating all the data and discussing the mean and maximum values, but also by mapping them to the zonal structure of the garnet. On the other hand, quartz eclogite collected in the Gongen area of the Sambagawa Belt shows multiple peaks when histograms are generated, which may reflect a combination of metamorphic conditions at various times. The highest peak at 0.7 GPa is considered to correspond to the peak metamorphic condition of quartz eclogite. On the other hand, the residual pressure peak in the range of 0.4-0.6 GPa on the low pressure side may reflect the timing of garnet growth during progressive metamorphism or reheating in the epidote-amphibolite facies after the eclogite facies. These data suggest that the residual pressure of quartz in garnet reflects various metamorphic conditions, and that careful consideration should be given to the metamorphic history of the rock when using a quartz Raman barometry to constrain the metamorphic conditions.

Keywords: Quartz Raman barometry, Residual pressure, Quartz, Garnet