



The Raman spectroscopy of carbonaceous material geothermometer revised – A standardised approach

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Maximum metamorphic temperature is a key parameter when reconstructing prograde metamorphism. A wealth of different methods exists, of which many exploit mineral reactions that are specific to certain pressure and temperature intervals. Such reactions favour elevated temperatures which complicates temperature estimation for low- to sub-greenschist facies conditions. The predominantly temperature controlled conversion of sedimentary organic matter to (meta-)graphite allows designing a continuous geothermometer from diagenetic to amphibolite facies conditions.

However, the estimation of the peak metamorphic temperature by Raman spectroscopy of carbonaceous material (RSCM) is influenced by several bias sources grouped in measuring conditions, spectral processing and sample heterogeneity. The measuring conditions (selected excitation wavelength) and the operator bias during spectral processing have a pronounced impact on the temperature estimate and thus on the comparability and portability of thermometric data obtained by RSCM. Several calibration lines of RSCM geothermometers are published already, but no standardised approach exists. Samples of carbonaceous material bearing metasediments with well-established metamorphic conditions of the central and western Alps compile a reference series. By applying an automated, iterative and randomised curve-fitting approach, a consistent and user input-independent RSCM geothermometer is presented, which covers peak metamorphic temperatures from ca. 160 to 600 °C. The method is hardware independent because the measuring conditions bias is excluded by the use of the reference series and the automated curve-fitting approach reduces the spectral processing bias effectively, increasing the method's comparability and portability. By distributing the reference series and the automated curve-fitting software, a laboratory will be able to derive a laboratory specific calibration line for the RSCM geothermometer.