Raman Spectroscopy of Carbonaceous Material (RSCM) geothermometery in rocks of advanced diagenesis processes and low-grade metamorphism : application to the Franciscan Complex, CA, to examine the pressure effect

Abdeltif Lahfid, Brice Lacroix, Sylvain Delchini

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Abstract

The reconstruction of the thermal history of rocks, transformed under conditions of advanced diagenesis processes and low-grade metamorphism, is still an issue. Generally, a combination of many classical methods, such as, Illite cristallinity, vitrinite reflectance and fluid inclusion thermometry is widely used to estimate the paleotemperatures of the rocks in the range 200-350°C. These methods are not perfectly reliable taken individually and there is still a need for a good geothermometer for this range of temperature. The Raman Spectroscopy of Carbonaceous Materials (RSCM) geothermometer was calibrated to estimate maximum paleotemperature in the range 200-320°C using samples from Glarus area and defining RA1 parameter. The purpose of this study is to study the effect of the pressure on the application of this parameter RA1 in other geological contexts with high pressure. Indeed in the Glarus area, temperature is most likely the aim parameter controlling the structure evolution of low-grade metamorphic carbonaceous materials. Thus, we have chosen the Franciscan Complex in central California, which underwent high-pressure/low-temperature metamorphic conditions. This context allows discussing the effect of the pressure on the Raman geothermometer in low-grade of metamorphism. The Raman temperatures obtained in the Franciscan Complex samples concord with data provided by classical methods.

This result shows that the RSCM geothermometer could contribute to study the thermal history of deep petroleum exploration systems evolved under high-pressure conditions.

Keywords:

Geothermometry, advanced diagenesis, low grade metamorphism, carbonaceous materials (CM), Raman spectroscopy, pressure effect.