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Contribution of the RSCM geothermometry to understanding the thermal history of the Hajjar deposit (Guemassa massif, Morocco).

The knowledge of the thermal history of rocks is a key point for reconstructing the history of basins or mountain belts for mining or petroleum industries. Conventional techniques such as mineralogy, isotopic analysis, provide basic data concerning the maturity degree of organic matter. Recent new geothermometric approach based on the Raman Spectroscopy of Carbonaceous Materials (RSCM) has been developed. This approach allows successfully estimating peak temperatures of advanced diagenesis to high-grade metamorphic rocks.

The aim of this study is mainly to apply the RSCM geothermometry for 3D paleotemperatures cartography in the Guemassa area, a Hercynian massif located at 35 Km SW of Marrakech, Morocco. This area composed of the carboniferous metasediments, underwent tectonic, metamorphic and hydrothermal events that explain the presence of several base metal deposits like Zn-Pb-Cu Hajjar mine. Combining RSCM data and classical methods of thermometry like fluid inclusions and chlorite thermometry will allow a good understanding of thermal history of Hajjar deposits.

The samples used in this study were collected around the Hajjar mine and from different depths in the Hajjar body collected in the footwall and hangingwall of the massive ore.

Our peak temperature estimates show values superior to 500°C. These temperatures differ from the ones obtained by other classical methods, which are not higher than 450°C. Nevertheless, fluid inclusion homogenization temperatures of 450°C represent minimum trapping temperature conditions, since the fluids were trapped above boiling conditions. Also, 450°C represents minimum thermic condition for the biotite isograd. Higher Raman temperatures obtained in this work confirm the hypothesis of a late heat flow related to a deep granitic intrusion. This intrusion could be closer to the Hajjar deposit which would explain the higher Raman temperature around the mineralization.

It is important to properly evaluate the consequences of this high late heat flux on the Hajjar mineralization, as it may have caused the recrystallization of the ore, with an increase of the particle size related. This thermal event could also have generated new mineralizing fluids.

That is why future work will include the acquisition of complementary geochemical, chronological and structural data to better explain these high temperatures and to analyse their impact on the mineralization and their possible link with different mineralization processes.