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Geothermometry of graphitic material in metasedimentary rocks of the Sierra Madre Oriental, NE, Mexico: revealing the last stages of Pangea.

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Metamorphic rocks with both sedimentary (psammite, pelite, turbidite, conglomerate, black shale) and igneous (tuff, lava flows, pillow lava and ultramafic bodies) protoliths, take part of the basement of the Sierra Madre Oriental in NE Mexico. These rocks are known as Granjeno Schist and are considered as remnants of the Laurentia-Gondwana collision. Within the variety of lithologies in the Granjeno Schist it is possible to recognized graphite and fine-grained dispersed carbonaceous material.

Previuos works estimated according to a chlorite geothermometer and the presence of phengite in the metasedimentary units as well as 40Ar/39Ar ages on metavolcanic rocks that the Granjeno Schist was metamorphosed under sub-greenschist to greenschist facies with temperatures ranging from 250-345°C with 2.5 kbar during Carboniferous time (330-30 Ma).

In this study we consider graphitization conditions due this process is an irreversible process. During metamorphic processes, organic matter is progressively transformed into graphite and the degree of maturation or graphitization of graphitic materials is a potential tool, therefore, considered as a reliable indicator of peak conditions of the metamorphic temperatures experienced by the host rocks.

The characteristics and metamorphic peak conditions of graphitic material within the metasedimentary rocks are studied using optical microscopy, and Raman microspectroscopy. The thermometry of graphitic material by Raman spectroscopy was calibrated for the temperature range from 360 to 650 °C.

According to our results graphitization process in the Granjeno Schist occurred at temperature ranges between 323°C and 606°C, revealing higher metamorphic temperatures as previously proposed.

We suggest that these sediments rich in organic matter were part of the floor of an ancient sea, possibly the Paleo-Pacific Ocean transformed by low to high temperatures into graphitic schist. Today these rocks form part of the Sierra Madre Oriental in Mexico, where erosion will start a new cycle.