GEOTHERMOMETRY AND CRYSTALLINITY OF THE PERESOPOLIS GRAPHITE DEPOSIT, CUIABÁ GROUP, PARAGUAY BELT

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ABSTRACT: Carbonaceous materials are diffuse in the most diverse geological contexts in both reduced forms as graphite and diamond and, in oxidized form as carbonate. The initial organic matter when submitted to metamorphic events is progressively transformed into graphite through the continuous loss of heteroatoms and the reorganization of the structure. This evolutionary process is recorded in the lattice of the carbonaceous material presenting a high correlation with the metamorphic degree and is not affected by retrogression, featuring a potential geothermometer. Several studies have shown the use of Raman spectroscopy to characterize carbonaceous material in metasediments where changes were observed in the spectrum according to the temperature, such as band position, width, and peak intensity. The Raman spectroscopy proved to be an analytical technique of high resolution and sensitivity in carbonaceous compounds including amorphous materials with no need of previous chemical treatments preserving the integrity of the carbonaceous material avoiding possible measurements mistakes. Based on this theory the use of the Raman spectroscopy as a geothermometer was performed in the Peresopolis graphite deposit located northeast of Brasilândia Town in Mato Grosso State (Brazil). It consists of an 1800 m long, 200 m wide low-crystallinity graphite-bearing tabular layer that trends ENE and dips 65°ESE. The deposit is hosted in carbonaceous phyllites, which along with basal metadiamictites and upper metarenites make up the upper unit (Coxipó Formation) of the Cuiabá Group in the late Cryogenian to Cambrian Paraguay Belt (ca. 650-500Ma). The carbonaceous phyllites show a mineral assemblage consisting mostly of graphite-quartz-muscovite-albite and pyrite and dolomite to a lesser extent; alteration minerals include tosudite and kaolinite. X-ray diffractometry (XRD) analysis confirmed the gangue material and defined the graphite as low-order crystallinity through the interplanar distance. The decreasing of the space between the aromatic carbon layers indicates a strong correlation with increasing temperature and therefore metamorphic grade. One hundred and sixty measurements (160) of Raman graphite spectrum in eight thin sections returned a well-fit between full width at half maximum parameter (FWHM) which allowed its use as a geothermometer. The resulting temperatures are in the range between 285 and 300 °C ± 30 °C, indicating low-to very-low greenschist facies conditions for transformation of organic matter into amorphous graphite.

KEYWORDS: GEOTHERMOMETER; GRAPHITE; PARAGUAY BELT