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A FIRST GLANCE INTO THE RAMAN ANALYSIS OF PYROBITUMEN ASSOCIATED WITH THE ZINC DEPOSITS HOSTED IN THE VAZANTE GROUP

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Organic matter (OM) is often reported as pyrobitumens (PB) in many sedimentary-hosted ore deposits, such as the Carlin Au (e.g., Nanpanjiang Basin, China) and the Zn-Pb deposits (e.g., Irish Mid-Carboniferous). However, the role of OM in the genesis of such ore deposits remains uncertain. For instance, the interaction between the OM and the hydrothermal fluids has been evoked as a relevant factor to several processes that favours ore precipitation: (i) acting as a source of metal and sulphur to the fluid; (ii) transporting metal through polar organic compounds; (iii) promoting sulphate reduction reactions; (iv) accelerating sulphide precipitation through organic catalysers; and (v) enhancing pore-space development. Nevertheless, the timing and impact of each factor on a mineral system efficiency are not clear. In this study, we provide the preliminary results from the Raman analysis of the PB associated with hydrothermal alteration in the Vazante Group. This research aims to establish the link between both mineral and petroleum systems related to the abundant PB from ore deposits hosted in the Vazante Group. Five samples bearing PB were collected from the Bento Carmelo Quarry (BC; n=4) and the Bonsucesso Zn-Pb deposit (BS; n=1). Confocal laser micro-Raman spectroscopy was used to characterize the signal from the OM within the range of 400–4000 cm⁻¹, using a Horiba XploRa Plus™. The analyses were performed with an x100 objective, a holographic grating of 1200 grooves/mm, 10 accumulations, hole/slit set to 100 µm, and lasers of 532 and 785 nm. A calibration that uses the D1 band change with temperature was employed to estimate the temperatures recorded by the PB. Additionally, we used a portable X-Ray Fluorescence (pXRF) to qualitatively assess the metal content of the samples. The BC area displays dolostone affected by large dissolution breccias infilled by coarse saddle dolomite ± sphalerite. The PB in Bento Carmelo fill fracture porosity, vugs, the residual primary porosity, and sub-horizontal stylolites. The Bento Carmelo PB comprise black blocky aggregates sharp edges against the euhedral dolomite crystals. The BS dolomitic mudstone sample has coarse PB infilling a large fracture with blocky-shaped aggregates, bearing conchoidal fracture pattern, vitreous lustre, and hardness > 7 Mohs. The Bonsucesso PB shares striking similarities with "glassy carbon." The pXRF data indicate the PB-bearing samples are enriched in Zn (BC: 220–1.100 ppm; BS: 30–290 ppm). The Raman data from both areas display the D, G, S2, S3, and S4 spectral bands that indicate high temperature (> 200 °C). The estimated temperatures for BC are of 228–306 °C (n=15), whilst the BS reported values of 279–315 °C (n=5). These preliminary results indicate temperatures comparable to the maximum homogenization temperatures of fluid inclusions reported in adjacent deposits (e.g., Morro Agudo, Fagundes, and Ambrósia) in the area. This might suggest that pyrobitumen was linked to the mineral system evolution. Therefore, additional studies should indicate what role the organic matter played in the ore genesis of the Vazante Group. Acknowledgements: The authors would like to thank Petrobras and Nexa Resources for the support of this research.

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