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## Multi-analytical study of ceramic pigments application in the study of Iron Age decorated pottery from SW Iberia

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### ABSTRACT

A non-invasive multi-analytical approach combining optical microscopy (OM), micro-X-ray diffraction ( $\mu$ XRD), in-situ X-ray fluorescence spectroscopy (XRF), variable pressure scanning electron microscopy coupled with energy dispersive X-ray spectroscopy (VP-SEM-EDS) and Raman micro-spectroscopy has been employed for the first time to investigate the chemical composition of ceramic pigments in Iberian Iron Age ceramics. The methodology was applied in the study of red, black and white pigments on Iron Age decorated pottery from the archaeological site of Garvão (SW Portugal). The complementary methodology adopted in this study minimized the damage to the ancient artefacts and turned out to be essential in achieving a complete chemical and mineralogical characterization of pigment composition.

Results suggest that haematite ( $\text{Fe}_2\text{O}_3$ ) and pyrolusite ( $\text{MnO}_2$ ) are the main mineral carriers of the Fe and Mn chromophore ions, responsible respectively for the red and black colour. While illite ( $\text{K}(\text{Al},\text{Mg},\text{Fe})_2(\text{Si},\text{Al})_4\text{O}_{10}(\text{OH})_2$ ), a common clay mineral, is

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