LT-hydrothermal Fe-oxide/sulphide breccias hosted in Jurassic limestones of the Lusitanian Basin (W Iberian Margin); a key-window to concealed ore-forming systems?

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The Lusitanian Basin (LB, at Western Iberian Margin), developed during Mesozoic times as a result of the Northern Atlantic Ocean opening, includes vast carbonate syn- to post-rifting sequences. Some of these display attributes that have long attracted the interest of companies oriented to the exploitation and transformation of industrial minerals/rocks and ornamental stones; but they are largely neglected as potential host of ore-forming systems, despite the favourable geodynamic background to trigger and sustain processes with metallogenic significance throughout all of the LB evolution. Compiled evidence justify the need to explore in detail some work hypothesis supported by innovative data gathered in fault-controlled breccias that affect some sections of the Jurassic limestones, and comprise as cement massive Fe-oxides along with minor amounts of sulphides: could these unusual occurrences represent key-windows to some kind of concealed mineralising systems in LB?

The mineralised breccias are confined to local structural arrays that record evidence of multiple reactivation events correlative of the coalescence of several en échelon, WNW-ESE trending, fault segments. A wide metasomatic halo encircles the fault zone, imprinting a strong colour change in limestones along with irregular dissemination of fine-grained Py+Mgt±Hem. Heterometric breccia-elements include mostly fragments of strongly altered limestones and of early carbonate infillings. The cement is composed of Mgt and/or Hem (and their pseudomorphs, martite and mushketovite), besides Cal aggregates variably enriched in Fe, Mg, Mn, Ba, Sr and REE; the prevailing accessory phases include fine-grained Py±Ccp, Ba-rich Phl and Chl (often incorporating Fe3+). The Fe-oxide/sulphide enrichment is thus epigenetic and, according to Mgt and Chl EPMA data, took place under relatively low temperature conditions (<250±25°C). This fault-controlled, LT-hydrothermal system was conceivably sustained by the anomalous (intermittently high) thermal gradients experienced by the LB during its evolution and should have involved fluids chemically equilibrated with redbeds and shales/evaporites forming the deeper levels of the Mesozoic sedimentary sequence.