

Original Article

Cite this article: Pereira Z, Matos JX, Solá AR, Batista MJ, Salgueiro R, Rosa C, Albardeiro L, Mendes M, Morais I, de Oliveira D, Pacheco N, Araújo V, Castelo Branco JM, Neto R, Lains Amaral J, Inverno C, and Oliveira JT. Geology of the recently discovered massive and stockwork sulphide mineralization at Semblana, Rosa Magra and Monte Branco, Neves–Corvo mine region, Iberian Pyrite Belt, Portugal. *Geological Magazine* <https://doi.org/10.1017/S0016756820001284>

Received: 2 June 2020

Revised: 16 October 2020

Accepted: 26 October 2020










Keywords:

Neves–Corvo mine region; mineral exploration; palynostratigraphy; U–Pb geochronology; Iberian Pyrite Belt; Portugal

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Geology of the recently discovered massive and stockwork sulphide mineralization at Semblana, Rosa Magra and Monte Branco, Neves–Corvo mine region, Iberian Pyrite Belt, Portugal

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Abstract

The recently discovered massive and stockwork sulphide mineralization of Semblana-Rosa Magra and Monte Branco, situated ESE of the Neves–Corvo volcanogenic massive sulphide (VMS) deposit in the Iberian Pyrite Belt (IPB) is presented. Geological setting and tectonic model is discussed based on proxies such as palynostratigraphy and U–Pb zircon geochronology. The mineralization is found within the IPB Volcano-Sedimentary Complex (VSC) Lower sequence, which includes felsic volcanic rocks (rhyolites) with U–Pb ages in zircons of 359.6 ± 1.6 Ma, and black shales of the Neves Formation of late Strunian age. Massive sulphides are enveloped by these shales, implying that felsic volcanism, mineralization and shale sedimentation are essentially coeval. This circumstance is considered highly prospective, as it represents an important exploration vector to target VMS mineralization across the IPB, in areas where the Lower VSC sequence is present. The Upper VSC sequence, with siliciclastic and volcanogenic sedimentary rocks of middle–late Viséan age, shows no massive mineralization but a late Tournaisian (350.9 ± 2.3 Ma) volcanism with disseminated sulphides was also identified. Nevertheless, stratigraphic palynological gaps were found within the Strunian and in the Tournaisian sediments, between the Lower and Upper VSC sequences, reflecting probable erosion and uplift mechanisms linked with extensional tectonics. The Semblana and Monte Branco deposits and the Rosa Magra stockwork are enclosed by tectonic sheets that dismembered the VSC sequence in a fold-and-thrust tectonic complex, characteristic of the NE Neves–Corvo region. The methodologies used allow a geological comparison between Neves–Corvo and other IPB mine regions such as Lousal–Caveira, Herrerias, Tharsis and Aznalcollar.

1. Introduction

The Neves–Corvo mine region is located in the southeastern sector of the Rosário–Neves–Corvo antiform, a NW–SE-oriented structure (Fig. 1) of the Iberian Pyrite Belt (IPB). The IPB is part of the South Portuguese Zone (SPZ); it represents the southernmost major tectonostratigraphic segment of the Iberian Variscides, and is restricted to sedimentary and igneous rocks of Devonian and Carboniferous age (Quesada *et al.* 2019).

The IPB is a world-class distinctive mining province with unusually large metal sulphide concentrations in giant and super-giant massive sulphide ore deposits such as Aljustrel and Neves–Corvo in Portugal and Río Tinto, Las Cruces, Aguas Teñidas–Magdalena, Tharsis, La Zarza, Sotiel, Aznalcollar and Los Frailes in Spain, as the most representative (Barriga *et al.* 1997; Leistel *et al.* 1998; Tornos, 2006; Locutura, 2011; Almodóvar *et al.* 2019; Gisbert *et al.* 2019). Lousal, Caveira and São Domingos in Portugal and Herrerias in Spain are smaller deposits in the IPB. These mineralizations are hosted by bimodal volcanic sequences included in the Volcano-Sedimentary Complex (VSC, Famennian – late Viséan age) (Oliveira *et al.* 2019; Quesada *et al.* 2019). Extensional processes during Upper Devonian time led to the IPB basin