SEG-MJD 2016 Conference

Tracking Magmatic Input into Fe Skarn and Ore Formation: Elba Island, Tuscan Metallogenic Province, Italy

Kalin Kouzmanov,[1,*] Andrea Dini,[2] Carlos Arbiol,[1] Natalia Karadima,[3] Nuria Bach,[1] Luca Caricchi,[1] and Markus Wälle[3]

[1]University of Geneva, Department of Earth Sciences, Geneva, Switzerland
[2]Italian National Research Council (CNR), Institute of Geosciences and Earth Resources, Pisa, Italy
[3]ETH Zurich, Institute of Geochemistry and Petrology, Zurich, Switzerland

*Corresponding author: e-mail, kalin.kouzmanov@unige.ch

Elba Island is located at the northern end of the Tyrrhenian Sea, an extensional ensialic back-arc basin developed behind the eastward-progressing compressive front of the Apennine belt. It is part of the Tuscan magmatic and metallogenic province and hosted some of the most important Fe deposits in the Mediterranean region, exploited from the Etruscan times (ca. the eighth to seventh centuries B.C.) until the 1980s. Elba Island is made of a stack of five tectonic complexes emplaced during the Apennine orogeny and was affected by extensional tectonics during the late Miocene that resulted in the emplacement of several magmatic suites consisting of laccoliths, plutons, and dike swarms (mainly tourmaline-bearing granites). Iron deposits occur in a relatively narrow belt with N-S extension along the eastern coast of the island and are hosted by different lithological units. Orebodies can be subdivided into two types: (i) magnetite-dominated skarn deposits, such as Capo Calamita, Sassi Neri, and Ginevro, and (ii) hematite-dominated replacement deposits such as Rio Marina, Rio Albano, and Terra Nera (interpreted in the past to be of syngenetic origin or resulting from partially reworked pyrite-rich protore). This contribution integrates the results of detailed geological, mineralogical, and geochemical study of the Rio Marina deposit and the neighboring Torre di Rio distal hedenbergite-ilvaite skarn and discusses the potential role of the crustal peraluminous magmatism and associated magmatic fluids in the skarn- and ore-forming processes. Anomalously high concentrations of B, Sn, and W registered in the magmatic rocks from the Tuscan magmatic province have also been identified by in situ LA-ICP-MS analyses in the skarn-forming (hedenbergite, ilvaite, epidote) and hydrothermal ore minerals (hematite, sphalerite). Anomalous concentrations of Sn and W in the bulk hematite ores from Rio Marina mine have been already described by other authors. The coupled B and Sn-W anomalies provide the first direct evidence of a magmatic source of metals in the skarn and Fe ore environment on Elba and thus demonstrate that the late Miocene magmatic activity had mineralizing potential and was genetically associated with the ore formation, even if a direct spatial association is missing. Small-scale detailed mapping of the orebodies and distribution and textural analysis of alteration and mineralization, supported by the geochemical signatures of skarn and ore minerals, unambiguously demonstrate the epigenetic character of the Rio Marina deposit.