

Abstract

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Base metals and other elements potential in waste materials resulting in improvement of the wastes environmental quality
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Abstract

Ore minerals reveal information on their origin and their life history. However, ore minerals are not just valuable as sources of metals but may also be viewed as environmental pollutants responsible for the generation of acid mine waste runoff, and for the release of various toxic metals into the environment. The study conducted in the S. Domingos and Aljustrel mines is part of the research project PROMINE (*Nano-particle products from new mineral resources in Europe*), a EU 7th Framework's Programme. Geochemical campaigns were conducted aiming the characterization of the mine's wastes/products. S. Domingos and Aljustrel mines showed high potential for wastes as new products some of which are critical raw materials. The S. Domingos massive sulphide orebody, dominated by pyrite, is located at the top of a Volcanic Sedimentary Complex (VSC) sequence. The ore interesting grades of Sb (above 1%), Bi (above 0.2%) and Re (until 3.4 mg kg⁻¹) along with the base metals were found in the Achada do Gamo waste pile of these Cu-rich pyrite ores near the sulphur factories where ashes, milled pyrite and debris of ore minerals were deposited. Paleoweathering of the S. Domingos orebody has resulted in an important gossan horizon which was intensely mined during Roman occupation of Iberian Peninsula and subsequently mined out in the 19th century. In this gossan dump interesting Au concentrations (1 to 4 mg kg⁻¹) can still be found. Just as in S. Domingos, Aljustrel was also mined since pre-Roman times and was a very important Roman exploitation centre (Vipasca) is recognised on site. Modern mining began in the 19th Century. The 19th Century separation technology was carried out in "telleiras" a pyrite ore roasting process developed at Pedras Brancas, located 6 km east of Aljustrel. These ore processed materials presented 0.9 mg kg⁻¹ of Au but are already deposited in a remediated area of Algarés sector. Milled pyrite deposited in Algarés sector have Au (280 µg kg⁻¹), Ag 29 mg kg⁻¹), Pb (above (5000 mg kg⁻¹), Sb (465 mg kg⁻¹), Sn (115 mg kg⁻¹) and Zn (887 mg kg⁻¹). Although high, these concentrations are lower than for the same type of waste in S. Domingos. This situation was probably induced by different processes in the ore treatment where in Aljustrel (probable simple and coarse mill) the recovery of the metals was more efficient (Aljustrel mine was more modern than S. Domingos), or just different types of primary ores (different mineral constitution of the

São Domingos lens and the Aljustrel Moinho, Algares Aljustrel lenses). Recovery of their metals from the wastes is both of economic and environmental value.

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