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Geochemical and mineralogical characterization of granite quarry scraps for their valorization as raw materials for ceramic products.

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The extraction and processing chain of ornamental stones involves a long trail of waste throughout the process. In fact, about 20-22 % of the original block becomes waste in the cutting operations [1], and it goes up to 75 % of the excavated material when considering the entire chain from extraction to sawing, cutting, and polishing [2]. These percentages are higher in leuco-granite quarries as they are often crossed by dikes and small pegmatite intrusive bodies which are landfilled due to aesthetic defects that make them unusable in the context of ornamental stones.

The waste generated in the context of quarrying activities produces significant landscape and environmental problems due to the high volume and the possible presence of rare metals (Critical Raw Materials - CRMs) that can be mobilized and diffused in the hydrosphere and biosphere. In fact, massive accumulations of waste strongly impact the territories hosting the quarries due to land consumption and as possible sources of pollution [3].

The region of Sardinia (Italy) is the main producer of ornamental granite, with currently more than 350 active and inactive quarries, and huge amounts of waste from granite processing have accumulated in quarry areas throughout the region and these quarries are also near archaeological and landscape interest areas.

This paper focuses on a quarry located in the municipality of Buddusò, in the quarrying district of northern Sardinia. In this quarry, which has been active for over forty years, massive waste deposits have been created and can be seen a few km away from the site.

The aim of this work is to characterize from a geochemical and petrographic point of view the granite waste coming from the quarry and the products obtained through the processes of crushing and gravitational and magnetic separation of the minerals operated on such waste. This is to evaluate the possibilities of recycling granite waste for possible use in the context of the ceramic industry and to explore the possibility of extracting REE since this waste is rich in allanite (rare earth epidote).

The results of the analyses highlighted a rather homogeneous chemical-mineralogical composition of the samples taken from the various landfills present in the quarry under study.

As regards the results of the analyses carried out on the products obtained through the working processes on granite scraps, they have highlighted a high potential of these materials for possible use in the context of the ceramic industry. In fact, the composition of these products showed very low Fe_2O_3 content ($< 0.35\%$) and falls within the compositional ranges proposed by Fabbri & Fiori [7] of raw materials for mixtures to produce stoneware.

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