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Gravity and Magnetic Separation for Recycling of Granite Scraps in the Buddusò Quarrying District (Northern Sardina, Italy)

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In recent decades, the recovery of materials and energy from waste materials has received attention, with the aim of finding a sustainable solution to reduce the exploitation of natural resources and reduce the use of landfills, stimulating a growing interest in the reuse of waste. In recent years new digital technologies continuously require rare metals, the abundance of which in the earth's crust is limited, and, for this, they are classified with me as critical raw materials. The Green Deal requirements call for improvements in the treatments for the extraction of raw materials also, and above all, from the gangues and waste materials from mining activities. Quarrying and processing of granite, for example, produce large amounts of waste residues, that besides being a loss of resources, improper disposal of these wastes results in pollution of the soil, water and air around the dumpsites.

This work aims to investigate the magnetic properties of mineral constituents of Buddusò Granites (Northern Sardinia) through the use magnetic separator in conjunction with gravity pre-concentration steps, using a shaking table to concentrate the valuable minerals and eliminate the undesired gangue minerals. These can be preliminary treatments for the possible use of granite scraps from quarries in the granite quarrying district of Buddusò as secondary raw materials. The granite waste samples were initially crushed using a jaw crusher and subsequently sieved to retain the part of the material with a grain size between 0.850 mm and 0.125 mm at a laboratory scale. The material was subjected to a preliminary separation process using a shaking table and obtaining seven subsamples were obtained starting from the initial one. Gravity separation was carried out in this work to discard the light gangues and obtain heavy mineral concentrate. The concentration process using shaking table is controlled by a number of operating variables, such as feed rate, wash water, feed pulp density, deck slope, amplitude particle size range, and as well as particle shape and the shape of the deck, play an important part in table separations. The sub-samples obtained by gravimetric separation were first placed to dry in an oven at 105 ° C for 24 hours and then has been treated by magnetic separation, which has been carried out in this work to separate paramagnetic (weakly magnetic) materials from non-magnetic materials. Each subsample, after being quartered, was then subjected to magnetic separation using the Frantz

instrument, to separate the magnetically susceptible minerals from the others. This operation was first performed at low magnetic field strength to separate minerals with lower susceptibility and subsequently performed at high magnetic field strength to separate minerals with higher susceptibility.

According to Raslan et al., 2021, the preliminary results obtained, it is clear that the combination of gravity pre-concentration, using a shaking table, combined with magnetic separation, using dry high-intensity magnetic separator, is able to successfully concentrate heavy, paramagnetic and diamagnetic minerals phases, all of them with high mining potential.