

Adding value to waste streams for a sustainable mineral supply chain

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Each year, more than 90 billion tonnes of raw materials, including industrial minerals, metal ores and fossil fuels, are extracted from the Earth. After industrial processing, more than 30% of this stock is either emitted to the atmosphere as greenhouse gases or dispersed in the environment as unrecoverable waste. Another 30% share is disposed of in landfills or other waste facilities. Only less than 10% of the total mass of extracted materials is upcycled and re-introduced in the supply chain as a secondary raw material (data source: www.circle-economy.com). Moreover, the extraction of mineral resources is drastically affecting the landscape, with a magnitude comparable to geological forces, which lead to the introduction of the Anthropocene concept.

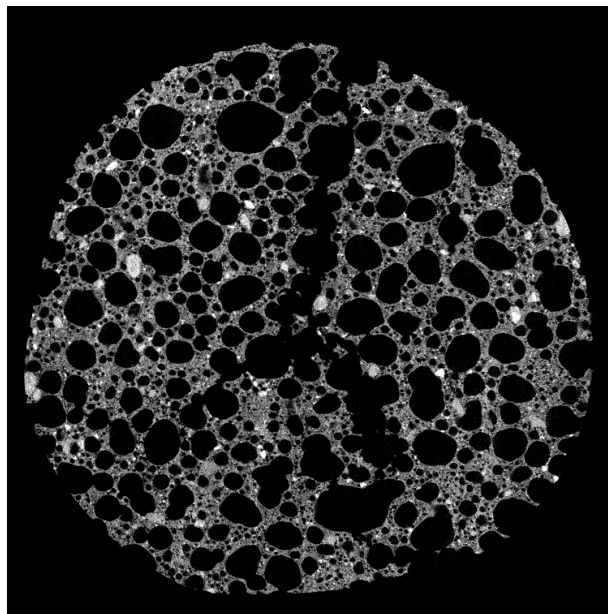
It is therefore mandatory to deploy strategies that make the mineral supply chain greener, with the aim of mitigating: a) CO₂ emission to the atmosphere; b) anthropogenic modification of the environment; c) pressure exerted on landfill facilities.

This project addresses the above issues by exploring solutions aimed at adding value to industrial mineral waste such as slags from iron production and processing, and slurries from the dimension stone industry. Specific focus is given to the production of porous solids (foams) using various types of slag as a secondary raw material. The possibility of using these porous materials for specific applications, such as water and air purification, and production of insulating lightweight panels, is explored.

To achieve these goals, the properties of these materials will have to be optimized by an integrated approach that combines: testing of the mechanical properties, microstructural investigation by electron microscopy and X-ray microtomography, analysis of the pore structure and connectivity.

Collaborations: part of the project will be carried out in collaboration with the OPIGEO spinoff

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XCT scan of porous material analysed at the Department of Geosciences