Recovery of mining wastes for eco-efficient mortar production

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Traditional construction materials come from primary resources, which are damaging the environment and becoming gradually limited. Mines produce volume-wise more waste than has originally been mined. Advances in solid waste management resulted in alternative construction materials. This work aims to develop an eco-efficient strategy to produce mortars, based on the rejected fraction from the mining process. It will also be tested a pre-treatment approach aiming simultaneous hazardous metals removal and critical raw materials (CRM) recovery. The idea is to make this source safe for further reuse in construction, with similar or improved properties to traditional materials

OBJETIVES

↓ Primary resources exploitation
↓ CO_2 emissions
↓ Mining residues (MR) disposal

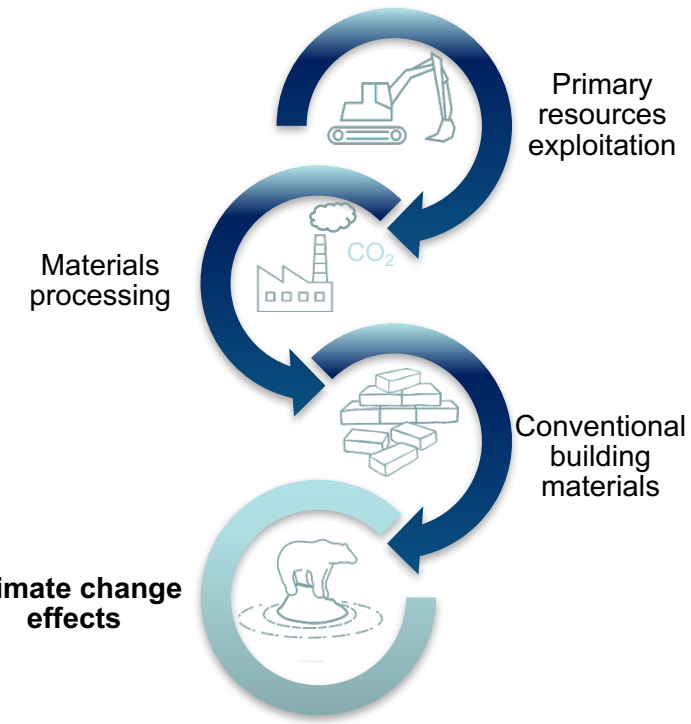
↑ Tungsten (W) recovery & Arsenic (As) removal strategies
↑ Eco-efficient building materials
↑ Circular economy in Europe

RESEARCH QUESTIONS

1) Is the electrodialytic (ED) process efficient for remove hazardous metals and recover CRM from MR?
2) Are MR, after submitted to the ED process, suitable for mortars production?
3) What is the optimized preparation of the by-product? Should it be grinded, milled, thermally treated?
4) What is the best by-product incorporation rate to produce a balanced and effective construction material?
5) What are the chemical and physical properties of the resulted construction material?
6) What is the durability and the LCA of the final product?

To promote construction and rehabilitation in benefit of sustainability, it is necessary to convert secondary resources safe for further reuse in construction

SCOPE



✱ 10% of global CO_2 emissions are due to the provision of building materials

METHODOLOGY

MR = Secondary Resources (*Panasqueira Mine, Covilhã, Portugal*)

- **Electro-based technologies**
  - ✓ *Removal hazardous metals* **As**
  - ✓ *Recovery CRM –* **W**
- Selection of resources to add in materials production
  - ✓ *Incorporation of remediate mining residues*
- **Eco-efficient materials**
  - Hardened & fresh state characterization
    - ✓ *Mechanical, physical, chemical & microstructural properties*
  - Optimization of materials for different applications
- **Life Cycle Analysis (LCA)**
  - ✓ *Environmental impacts*
  - ✓ *Embodied energy*

RESEARCH IMPACT

✓ ED potential to remediate MR & optimize mortars properties
✓ Chemical & physical characterization of obtain materials
✓ Most efficient mixture & rate of MR incorporation in mortars
✓ Environmental impacts of the final product

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