Bridging barriers to enable recycling of phosphogypsum in alternative cementitious binders

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ABSTRACT

The recycling of phosphogypsum (PG) in construction materials represents a multidisciplinary challenge where technical, radiological, chemical and stakeholder perception related barriers need to be overcome. From the 215 million-ton PG that is produced annually only 60-80 million ton is being recycled. In this context it is important to make a distinction between the recycling of the -often well controlled product- PG that is produced directly from industrial processes and the very heterogeneous PG that is present in landfills. [1]

For the replacement of gypsum in different cementitious binders and concrete types, PG can be considered. Remaining traces of phosphoric acid, fluorides, metals, naturally occurring radionuclides, rare earth elements or organic substances in PG can however influence the mechanical properties of cementitious binders (e.g. delay in setting time, reduction in workability or strength), require additional measures for handling by construction workers or result in a negative environmental impact. [2]

The current study takes a closer look at the different barriers that limit/inhibit the recycling of PG in alternative cementitious binders and concretes such as ettringite and alkali activated binders and concretes using these binders. The research needs and steps to overcome these barriers are discussed. The focus of the study is on recycling of PG in cementitious binders and concretes considering legislative (e.g. Euratom Basic Safety Standards (EU-BSS)), technical (focusing on mechanical properties), safety and environmental requirements (radiological and leaching properties) and considering the input from socio-economic research on stakeholder perception and acceptance. The study aims to contribute to the construction of a strategic research road map identifying multidisciplinary research gaps regarding the use of naturally occurring radioactive materials in new cementitious binders and concretes.

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References

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