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Advances in alternative cementitious binders

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ABSTRACT

There is a burgeoning interest in the development, characterization, and implementation of alternatives to Portland cement as a binder in concrete. The construction materials industry is under increasing pressure to reduce the energy used in production of Portland cement clinker and the associated greenhouse gas emissions. Further, Portland cement is not the ideal binder for all construction applications, as it suffers from durability problems in particularly aggressive environments. Several alternative binders have been available for almost as long as Portland cement, yet have not been extensively used, and new ones are being developed. In this paper, four promising binders available as alternatives to Portland cement are discussed, namely calcium aluminate cement, calcium sulfoaluminate cement, alkali-activated binders, and supersulfated cements. The history of the binders, their compositions and reaction mechanisms, benefits and drawbacks, unanswered questions, and primary challenges are described.

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1. Motivation

Since the development of Portland cement over 175 years ago, it has become the dominant binder used in concrete for construction. Annual worldwide Portland cement production is approaching 3 Gt

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