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Information Paper

Alkali-activated binders for precast and ready-mixed concrete products

New supply chains, business models and environmental benefits

Andrew Dunster

The production of alkali-activated (AA) binders uses less energy and produces less carbon dioxide (CO_2) than conventional Portland cement (PC). These binders can also offer the concrete producer flexibility in raw materials sourcing and the opportunity to produce concrete products without using conventional cements. Although low-carbon concretes made from AA binders share some materials in common with conventional PC-based concretes, there are some significant differences in the supply chains and business models that apply to their manufacture and sale.

This Information Paper summarises the current position in this emerging area of construction technology. It draws on BRE's expertise in the area and provides essential support for those involved in adopting and utilising these new binders. This publication is intended to inform purchasers and specifiers of concrete and concrete products and those with a wider interest in the procurement of sustainable construction products.

Figure 1: Certain types of clay can, following thermal treatment, provide a suitable binder for alkali activation

Introduction

Alkali-activated binder technologies can utilise locally available clays, waste materials and industrial by-products in combination with a manufactured chemical activator; these novel binders are beginning to be regarded as one of several viable alternatives to PC in construction applications that currently utilise this conventional type of cement. These binders have the potential to play an important role in reducing the environmental impacts associated with global cement and concrete production[1, 2], which are considerable*. In many cases, AA binder technologies can also offer superior mechanical properties when subjected to high temperatures[3, 4], corrosive aqueous liquids[5, 6] or other aggressive environments[7], subject to satisfactory demonstration of durability. Concerns about the continued long-term security, acceptability and availability of PC in view of global CO_2 emissions targets, policies and industrial practices have been expressed by some concrete product manufacturers[8]. These concerns and customer demands for more sustainable products provide a further incentive towards these manufacturers adopting alternative binders.

This BRE Information Paper sets out, from a UK perspective, the types of supply chains (existing and potential) that are relevant to AA binders and describes business models for their introduction. It also provides an overview of the potential of these binders to contribute to the development of concrete and concrete products with reduced environmental impact.

* The UK cement sector was responsible for around 7 Mt of CO_2 emissions in 2010.