



Compatibility studies between N-A-S-H and C-A-S-H gels. Study in the ternary diagram $\text{Na}_2\text{O}-\text{CaO}-\text{Al}_2\text{O}_3-\text{SiO}_2-\text{H}_2\text{O}$

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ABSTRACT

Sodium aluminosilicate hydrate (N-A-S-H) gel, the main reaction product of the alkali-activated aluminosilicates, differs of the aluminium-modified calcium silicate hydrate (C-A-S-H) gel of PC pastes. Increasing the level of SCM to reduce PC content of binders are being considered to address reduction in CO_2 emissions, activation of the additional SCM content by alkali activation represents a possible environmentally sustainable solution. Therefore, mixtures of C-A-S-H and N-A-S-H gels might be anticipated and the present study assesses the compatibility relationships between them.

Compositional diagrams are provided to indicate phase compositional ranges and the phase assemblages obtained under equilibrium conditions. In calcium-rich formulations (pH in excess of 12), C-A-S-H and C_2ASH_8 form as stable phases. However, in the lime poor part of the diagram an amorphous gel (N,C)-A-S-H precipitates but its stability is dependent on system pH and available Ca. (N,C)-A-S-H gels are de-stabilised by Ca to give C-A-S-H gels in suitable systems.

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Contents

| | |
|---|-----|
| 1. Introduction | 923 |
| 2. Experimental procedure | 924 |
| 2.1. Precipitation/dissolution approach | 924 |
| 2.2. Direct mixing of gels | 925 |
| 3. Results and discussion | 925 |
| 3.1. Precipitation/dissolution approach | 925 |
| 3.1.1. Tentative phase diagram | 926 |
| 3.1.2. CaO-deficient gels | 928 |
| 3.1.3. Effect of pH | 928 |
| 3.2. Direct mixing of gels | 928 |
| 4. Conclusions | 930 |
| Acknowledgement | 931 |
| References | 931 |

1. Introduction

In the context of addressing environmental issues, specifically reducing CO_2 emissions, the possibility of diluting Portland cement

with high volumes of SCMs (Supplementary Cementitious Materials) is currently being considered. However, by diluting the PC (Portland cement) content, the ability to activate the SCM is reduced and the use of additional alkaline activator offers a possible solution.

The study of alkali activation of aluminosilicates is a relatively new field when compared with traditional Portland cement-containing systems [1–4]. Alkali-activated aluminosilicates are differentiated from hydrated Portland cements by their higher initial alkalinity and the absence of lime. This is already sufficient to define quite different hydration products from the different systems so that predictions of

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