

Chutrin Arunruviwat 2015: A Study of Relationship between the Ca/Si Ratio and Structural Properties of Calcium Silicate Hydrate (C-S-H) Gel. Master of Science (Chemistry), Major Field: Chemistry, Department of Chemistry.

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The present study investigated a relationship between Ca/Si ratio and structural properties of calcium silicate hydrate (C-S-H) gels. The structure of C-S-H was characterized by fourier transform infrared (FTIR) spectroscopy, X-ray diffraction (XRD) and  $^{29}\text{Si}$  magic angle spinning nuclear magnetic resonance ( $^{29}\text{Si}$  MAS-NMR) spectroscopy. FTIR analysis revealed that the type of silicate species in the C-S-H gel depended on the Ca/Si ratio. The results suggested that the structure of the C-S-H synthesized at low Ca/Si ratio was similar to silica gel, whereas the sample synthesized at high Ca/Si ratio contained high proportion of silicate chains. Both XRD and  $^{29}\text{Si}$  MAS-NMR confirmed phase and structure of the synthesized samples which were consisted of different silicate structures of C-S-H gel, namely,  $\text{Q}^1$ ,  $\text{Q}^2$ ,  $\text{Q}^3$  and  $\text{Q}^4$ . The structure of magnesium silicate hydrate (M-S-H) gel was studied. The results showed that the structure of the M-S-H was similar to C-S-H, but no  $\text{Q}^1$  silicate species was observed in its structure at high Mg/Si ratio. Furthermore, mixed silicate species between C-S-H and M-S-H were observed in the sample synthesized by using mixed hydroxides of calcium and magnesium. Finally, the FTIR analysis of the hydrated cement showed the component of calcium and magnesium in its structure. The results suggested the significant role of cation in advancing the formation of silicate chains, which could be of general interest in understanding the formation behavior of silicate species in cement and related materials.

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