

An overview on the effects of Si/Al ratios on the properties of alkali-activated cementitious materials in high temperatures

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ABSTRACT

In recent years, alkali-activated cementitious materials (AACMs) have been explored as promising alternatives to ordinary Portland cement (OPC), due to their thermal stability at high temperatures (Provis & Bernal, 2014). Recent studies have found that the properties of AACMs are closely influenced by the Si/Al ratios, which are determined by both the raw materials and alkali solution (Juengsuwattananon et al., 2019). Furthermore, previous studies have investigated the effects of Si/Al ratios on the workability, phase changes, microstructures, and the mechanical strengths of AACMs (Dehghani et al., 2021; Juengsuwattananon et al., 2019). In this regard, this study provides an overview in literatures of the effects of Si/Al ratios on the properties of AACMs. In addition, a preliminary study conducted by the authors regarding the effects of Si/Al ratios on the properties of alkali-activated fly ash/metakaolin AACMs when exposed to high temperature will be presented (Tay et al., 2023).

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REFERENCES

- Dehghani, A., Aslani, F., & Ghaebi Panah, N. (2021). "Effects of initial SiO₂/Al₂O₃ molar ratio and slag on fly ash-based ambient cured geopolymer properties", *Construction and Building Materials*, 293, 123527.
- Juengsuwattananon, K., Winnefeld, F., Chindaprasirt, P., & Pimraksa, K. (2019). "Correlation between initial SiO₂/Al₂O₃, Na₂O/Al₂O₃, Na₂O/SiO₂ and H₂O/Na₂O ratios on phase and microstructure of reaction products of metakaolin-rice husk ash geopolymer", *Construction and Building Materials*, 226, 406–417.
- Provis, J. L., & Bernal, S. A. (2014). "Geopolymers and related alkali-activated materials", *Annual Review of Materials Research*, 44, 299–327.
- Tay, S. Y., Jang, Daeik, Lee, H. K. (2023). "The effects of Si/Al ratios on the properties of the alkali-activated fly ash and metakaolin exposed to high temperatures," (in progress)

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