

## Documents

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**PARTIAL REPLACEMENT OF SILICA NANOPARTICLES IN CEMENT PASTE FOR CO<sub>2</sub> REGENERATION CAPTURE APPLICATION**

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**Abstract**

A promising, supplementary material, highly reactive silica nanoparticles tend to react with calcium species (Ca<sup>2+</sup>) in cement, which produces more hydrated phases. The high amount of calcium species and the potential of capturing carbon dioxide (CO<sub>2</sub>) through carbonation implies the suitability of cement paste as a CO<sub>2</sub> sorbent material. However, limited studies could be found highlighting the effect of silica nanoparticle inclusion on the CO<sub>2</sub> capture property of hardened cement paste. Thus, this study investigates the effect of silica nanoparticle partial replacement on the CO<sub>2</sub> capture capacity and regeneration performance of hardened cement paste. XRD and SEM analysis proved the formation of more hydrated phases upon partially replacing silica nanoparticles in cement. Partial replacement of 3.00 % with silica nanoparticles significantly improved CO<sub>2</sub> regeneration capture at room temperature among the other cement paste samples. This study found that the presence of silica nanoparticles in cement paste triggered the formation of more hydrated phases, which served as active sites for CO<sub>2</sub> capture to occur and, thus, improved the CO<sub>2</sub> capture capacity and regeneration performance. © (2024), (International Islamic University Malaysia-IIUM). All rights reserved.

**Author Keywords**

cement paste; CO<sub>2</sub> regeneration capture; hydrated phases; Silica nanoparticles

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