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Effect of Temperature on the Properties of Cement Paste Modified with Nanoparticles

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Abstract : The advent of nanotechnology has enabled innovative solutions towards improving the behavior of infrastructure materials. Nanomaterials have the potential to revolutionize the construction industry by improving the performance and durability of construction materials, as well as imparting new functionalities to these materials. Due to variability in the environmental temperature during mixing and curing of cementitious materials in practice, it is important to understand how curing temperature influences the behavior of cementitious materials. In addition, high temperature curing is relevant in applications such as oil well cement and precast industry. Knowledge of the influence of temperature on the performance of cementitious materials modified with nanoparticles is important in the nanoengineering of cementitious materials in applications such as oil well cement and precast industry. This presentation aims to investigate the influence of temperature on the hydration, mechanical properties and durability of cementitious materials modified with TiO2 nanoparticles. It was found that temperature improved the early hydration. The cement pastes cured at high temperatures showed an increase in the compressive strength at early age but the strength gain decreased at late ages. The electrical resistivity of the cement pastes cured at high temperatures was shown to decrease more noticeably at late ages compared to that of the room temperature cured cement paste. SEM examination indicated that hydration product was more uniformly distributed in the microstructure of the cement paste cured at room temperature compared to the cement pastes cured at high temperature.

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