MODELLING AND SIMULATION OF CONCRETE HYDRATION FOR RAPID CONCRETE PROPERTY ANALYSIS

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ABSTRACT

Hydration of concrete is difficult to predict and it is modelled by affinity hydration phenomena. Then the model was simulated with realistic parameters which are combined with formwork by finite element approach. Time dependent modelling and simulation were carried out for 15 [dm3] concrete blocks to non-isothermal conditions maintain inside the model. The **1/8** portion of a real geometry was used for modelling and simulation which is given as the symmetric and homogeneous profile. Initially, modelling and simulation was performed while the concrete block was insulated by polystyrene (EPS). The model was numerically and graphically validated using scholarly literature. Temperature and the degree of hydration (DoH) of each case of studies were analyzed by separate models and simulations. Thereafter, extended modelling and simulation were carried out when a wooden formwork is present. Finally, the results were compared and validated for given cases of insulated concrete by polystyrene layer which is made for uniform hydration of concrete. Finally, Affinity hydration model is validated with experimental data obtained under definite procedure. Thus, proposed model can be used as an accurate and valid approach to model and simulate the concrete hydration phenomena under defined formwork as well as different temperature profiles or changes in the environment.

Keywords: Hydration, Temperature, Finite element analysis, Concrete, Affinity