Experimental Study of fire effects on compressive strength of normal-strength concrete supported with nanomaterials additives

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Abstract: Fire in buildings is nearly always man- made, i.e. resulting from negligence or error, which can cause immense damage in terms of lives and property. Concrete is widely used as a primary structural material in construction due to numerous advantages, such as strength, durability, ease of fabrication, but one of the most important advantages of concrete over other buildings materials (steel, wood,) is its fire resistive properties. Fire resistance can be defined as the ability of concrete to enable the structural elements to withstand fire or to give protection from it [1]. This includes the competence to resist a fire or to continue to perform a given structural function, or both. Concrete regard as a fireproof because of its incombustibility and its ability to withstand high temperature without collapse. However, its properties can change dramatically when exposed to high temperature and many problems were experienced with concrete in fire such as deterioration in mechanical properties. A number of complex physicochemical reactions take place when concrete is heated, causing mechanical properties as compressive strength and stiffness to deteriorate. Using nanomaterials as additives into concrete production to improve its mechanical properties has emerged as a promising research field nowadays. A better understanding of complex structure of concrete based materials incorporating supplementary cementing materials at Nano-level may result in a new generation of concrete, stronger and more durable, with desired stress-strain behavior and possibly, with the whole range of newly introduced "smart" properties. Nanomaterials are very reactive because of the particle ‘s small size and large surface area and have great potential in improving concrete and cement properties such as compressive strength, permeability cement mortar, flexural resistance [2]. This study investigates the effect of nanoparticles on the compressive strength of normal-strength concrete after fire exposure. The experimental program focused on the effect of using Nano silica, Nano clay, and hybrid from both of them on some durability properties of concrete produced with the three materials as a partial replacement of cement at different ratios for each one.