



# 3rd International Nanotechnology Conference & Expo

May 7-9, 2018 Rome, Italy

## Nano-sized Silicate Hydrate for High Strength and Durable Concrete

Giorgio Ferrari  
Mapei S.p.A., Italy

This paper describes a new additive capable to effectively promote the development of early high strength and to reduce the water permeability of cementitious materials. Early high strength development is important in concrete technology to speed up the concrete production both in cold climates and in precast industry. The reduction of the permeability to water prevents the introduction of aggressive salts in the capillary pores of the cement paste and, therefore, increases the durability of concrete structures. The new admixture is an aqueous suspension of nano-sized metal transition polymeric silicate hydrate that catalyzes the homogeneous nucleation of calcium Silicate Hydrate (CSH) in the capillary pores of hydrating cement paste, promoting the early strength development. Furthermore, the crystallization of CSH in the capillary pores refines the capillary porosity of cement paste and significantly increases the resistance to water penetration under pressure. The mechanism of homogeneous crystallization of CSH was demonstrated by Synchrotron XRD micro-Tomography (XRD- $\mu$ T) and by Scanning Electron Microscope (SEM) investigations. The effectiveness of the new admixture was demonstrated by mechanical tests on concrete specimens and by measuring the water permeability according to European Standard EN 12390-8. The new admixture increases the early strength development of concrete and can be used to produce concrete with outstanding mechanical performances and durability and it is highly effective in reducing the penetration of water, compared to other permeability reducing admixture admixtures, working with different mechanisms.