World Academy of Science, Engineering and Technology
International Journal of Civil and Architectural Engineering
Vol:10, No:07, 2016

Effect of Mineral Admixtures on Transport Properties of SCCs Composites: Influence of Mechanical Damage

Authors : Davood Niknezhad, Siham Kamali-Bernard

Abstract : Concrete durability is one of the most important considerations in the design of new structures in aggressive environments. It is now common knowledge that the transport properties of a concrete, i.e; permeability and chloride diffusion coefficient are important indicators of its durability. The development of microcracking in concrete structures leads to significant permeability and to durability problems as a result. The main objective of the study presented in this paper is to investigate the influence of mineral admixtures and impact of compressive cracks by mechanical uniaxial compression up to 80% of the ultimate strength on transport properties of self-compacting concrete (SCC) manufactured with the eco-materials (metakaolin, fly ash, slag HF). The chloride resistance and binding capacity of the different SCCs produced with the different admixtures in damaged and undamaged state are measured using a chloride migration test accelerated by an external applied electrical field. Intrinsic permeability is measured using the helium gas and one permeameter at constant load. Klinkenberg approach is used for the determination of the intrinsic permeability. Based on the findings of this study, the use of mineral admixtures increases the resistance of SCC to chloride ingress and reduces their permeability. From the impact of mechanical damage, we show that the Gas permeability is more sensitive of concrete damaged than chloride diffusion. A correlation is obtained between the intrinsic permeability and chloride migration coefficient according to the damage variable for the four studied mixtures.

Keywords : SCC, concrete durability, transport properties, gas permeability, chloride diffusion, mechanical damage, mineral admixtures
Conference Title : ICCME 2016 : International Conference on Civil and Materials Engineering
Conference Location : Paris, France
Conference Dates : July 25-26, 2016