

Microstructure, Compressive Strength and Transport Properties of High Strength Self-Compacting Concretes Containing Natural Pumice and Zeolite

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Abstract : Due to the difficult placement and vibration between reinforcements of reinforced concrete and the defects that it may cause, the use of self-compacting concrete (SCC) is becoming more widespread. Ordinary Portland Cement (OPC) is the most widely used binder in the construction industry. However, the manufacture of this cement results in a significant amount of CO₂ being released, which is detrimental to the environment. Thus, an alternative to reduce the cost of SCC is the use of more economical and environmental mineral additives in partial or total substitution of Portland cement. Our study is in this context and aims to develop SCCs both economic and ecological. Two natural pozzolans such as pumice and zeolite are chosen in this research. This research tries to answer questions including the microstructure of the two types of natural pozzolan and their influence on the mechanical properties as well as on the transport property of SCC. Based on the findings of this study, the studied zeolite is a clinoptilolite that presents higher pozzolan activity compared to pumice. However, the use of zeolite decreases the compressive strength of SCC composites. On the contrary, the compressive strength in SCC containing of pumice increases at both early and long term ages with a remarkable increase at long term. A correlation is obtained between the compressive strength with permeable pore and capillary absorption. Also, the results concerning compressive strength and transport property are well justified by evaporable and non-evaporable water content measurement. This paper shows that the substitution of Portland cement by 15% of pumice or 10% of zeolite in HSSCC is suitable in all aspects.

Keywords : concrete, durability, pumice, SCC, transport, zeolite

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