The effect of aggregate mineralogy on the strength of High Performance Concrete in Oman

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Abstract

The majority of the crushers in Oman that supply aggregates for construction are located in the wadi areas, where a wide range of rock types are available. There are concerns of the presence of undesirable rock types, which are directly affecting the strength of the high performance concrete. This study investigates the mineralogy of aggregates from different sources in Oman and their effect on the strength of high performance concrete. Two aggregate sizes were studied, 10mm and 20mm and they are locally supplied from nine different areas in Oman; namely Muscat, Al Musanah, Sohar, Khassab, Sur, Nizwa, Ibri, Shaleem and Salalah. The aggregates were examined to identify their bulk densities, sizes grading, the percentage of water absorption and the specific gravities at saturated surface dry condition (SSD). In addition, they have been tested for Sulphate contents as well as for the chloride contents to check their durability. The obtained results of the above mentioned tests were compared with the allowed limits in the provided British standards and at ASTM standards. A petrological analysis was also done for all the samples to identify types of rocks available in each sample. The samples were then used in producing high performance concrete of 80 MPa. Water-to-binder ratio was kept constant at 0.32. The 7 days and 28 days compressive, flexural and splitting tests were conducted for all samples. The study proves that there is a minor change in the strength of high performance concrete due to abundant presence of strong types of rock in all aggregate samples like gabbros, limestone with fine grain and basalt which are enhancing the strength of the concrete.