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عنوان البحث للرسالة او الاطروحة: Mechanical Properties of steel fiber Reinforced Attapulgit Lightweight Aggregate Concrete

عناوين البحوث المستتلة: The Combined Effect of Attapulgit High Reactive Mineral Admixture and Superplastisizer on Compressive Strength of Attapulgit Lightweight Aggregate Concrete

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Abstract

The importance of Lightweight concrete opened the spaces widely for the development in the methods of production . The goal mainly , was to obtain lightweight aggregate concrete (LWAC) depending on local clay minerals of Attapulgitite to produce the lightweight coarse aggregate .

The production of the high reactive mineral admixture was from the same local clays as part of strategy to modify mechanical properties of structural Attapulgitite lightweight aggregate concrete (ALWAC) accompanied with the chemical admixture and the use of steel fiber .

The mix proportion of the materials was (1:1.12:0.84) with w/c ratio of 0.4 , 6% of high reactive mineral admixture of Attapulgitite , 0.5 L/100 kg cement of superplasticizer as a chemical admixture and four volume fraction of micro steel fiber (0.25% , 0.5% , 0.75% , 1%) to produce lightweight concrete meets the ACI 213R-03 requirements .

The tests for the mechanical properties of (ALWAC) were compressive strength , splitting strength , flexural strength , absorption , Ultra-sonic pulse velocity test and Rebound number test , for curing ages of 7 , 28 , 56 and 90 days .

The 28 days compressive strength , splitting strength and density results for the steel fiber free mix were 32 MPa , 3 MPa and 1818 kg/m³ respectively , higher than the required values of the ACI 213R-03 of 28 MPa , 2.3 MPa and 1840 kg/m³ respectively , for the structural lightweight concrete .

The results of the steel fiber free (ALWAC) mixes as compared with the reference mix indicated that there was a noticeable increase in compressive strength , splitting tensile strength , flexural strength , and static modulus of elasticity at the age of 28 days were (15.5% , 11% , 65% and 1.25%) respectively .

Also , it can be noticed from the results of the mixes with steel fiber that there was a remarkable enhancement for the mechanical properties of ALWAC and the optimum volume fraction was (0.75%) that showed percentages of increase (53.7% , 118.8% , 192% , 5.5%) for the properties of compressive strength , splitting strength , flexure strength and modulus of elasticity respectively , as compared with the referenced plane mix .

The maximum value of drying shrinkage in 90 days for ALWAC concrete was (- 391x10⁻⁶) mm/mm for the mix of steel fiber with 0.25 volume fraction .

The use of Attapulgitite high reactive mineral admixture had an excellent effect on the water absorption property of ALWAC by reduction of its values with about (4 -4.9) % .