Evaluation of slates from Attock-Cherat Range for use as structural lightweight concrete aggregate

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Lightweight aggregates are materials having densities less than the usual aggregates and used worldwide to reduce the dead load in bridges, dams and high raise buildings; moreover lightweight aggregate concrete have many comparative advantages in comparison to normal concrete, like fire resistance, thermal insulation, moisture resistance and sound proof structures. For this research samples were collected from different locations following two routs "Kaka Sahib to Akora Khattak (N33°55'56" E 072°02'38") and Attock to Peshawar (N33° 53'55.5" E072°17'08.8"). The Attock slates are located on the northern foothills of the Attock-Cherat Range of Khyber Pakhtunkhwa and Punjab. These slates have been evaluated chemically and physically for their use as structural lightweight concrete aggregate. XRF analyses showed some of the samples having little higher values of iron and loss on ignition, but are still within the permissible limits. Samples were bloated in a rotary kiln. After bloating physical tests were carried out according to the American Standards for Testing Materials (ASTM) specifications. Physical tests including iron staining, bulk density, specific gravity, water absorption, organic impurities, freezing thawing and alkali aggregate reactivity were conducted. Then concrete mix design for structural concrete was designed according to ACI 2112-98 and ASTM 330; concrete cubes, cylinders, and blocks were casted and their compressive, flexural and splitting tensile strength were determined. The results of all these tests were then compared with the ASTM standard values which showed the suitability of these slates for use as structural lightweight concrete aggregate.