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Engineering studies of aggregate from lightweight expanded slate of Manki Formation

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With increasing trend and need for the construction of multi-story buildings, construction companies and experts are more concerned over the use of construction materials that is lighter in weight to reduce the dead load. The use of structural grade lightweight concrete reduces considerably the self-load and permits larger precast units to be handled. Lightweight aggregate concrete (LWAC) has many comparative advantages over the commonly used concrete aggregates, for example LWAC is more fire resistant due to its verification, chemical inertness and cellular structure of the product. They have increased thermal insulation and moisture resistance and make more sound proof buildings. Moreover, it is wiser to use lightweight materials in construction of buildings in earthquake prone areas because of the improved seismic structural response of lightweight material. Pakistan has a considerable terrain that is seismically active, the most recent example being the deadly earthquake of October, 2005, which caused many tens of thousands of casualties.

Bloatable (expandable) argillaceous raw materials suitable for use in making lightweight aggregate exist in large quantities in Pakistan. For the present study, Precambrian slate from the Attock-Cherat ranges has been used to study its engineering properties for use as a lightweight aggregate concrete. Chemical analyses of the samples showed that loss on ignition varies from 3.45 to 4.56 %. The high contents of iron in the form of pyrite and hematite (5.23 %) and the content of alkalies (6.6 %) are indicative of better bloating properties in slate. The samples were fired in a rotary furnace at temperature ranging from 1050 to 1150 C° to achieve maximum bloating. After bloating, physical tests were carried out according to the ASTM specifications. The results of various tests, like water absorption, bulk density, chloride content, and soundness properties, meet the ASTM specifications of concrete and show the suitability of the rocks for use as a light weight aggregate for structural purposes.