PETROGRAPHIC, GEOCHEMICAL AND GEOTECHNICAL CHARACTERIZATION OF LOCKHART LIMESTONE, NIZAMPUR BASIN, KHYBER PAKHTUNKHWA, PAKISTAN

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Abstract

Limestone is an important raw material which is extensively used in construction and chemical industries throughout the world. Pakistan is bestowed with enormous deposits of limestone which are widely used in the construction of infrastructures. The huge deposit of Lockhart Limestone in Nizampur basin was petrographically, geochemically and geotechnically investigated in order to assess its feasibility as a potential source of construction aggregate. Petrographically, the Lockhart Limestone has been categorized according to Dunham classification as mudstone, wackestone and packstone having calcite and bioclast as major constituents. Under the thin section, quartz and dolomite were found in trace amount in the form of fine-grains while chalcedony, crystobalite and other deleterious minerals were not observed. Similarly, the geochemistry of studied rock indicates that CaO ranges from 49.41 to 55.08 % by weight, MgO 0.34-1.86%, SiO_2 0.00-1.95% and other oxides such as Fe_2O_3, TiO_2, Al_2O_3, MnO, K_2O, P_2O_5, and Na_2O are in trace amounts. The average values of physical tests on aggregate, such as apparent specific gravity is 2.698, bulk oven dry specific gravity is 2.657, bulk saturated surface dry specific gravity is 2.673, water absorption is 0.531%, porosity is 0.74%, bulk unit weight is 1.56 gm/cc, clay lumps and friable particles is 0.47%, soundness is 2.14%, Los Angeles abrasion value is 23.85% and Impact value is 14.66%, and are under the specific limits of the ASTM. Other geotechnical properties such as UCS and UTS were statistically compared with petrographic features using linear regression analysis. The results show that the strength and durability of Lockhart Limestone are directly related to calcite content and inversely related to bioclasts and porosity. The petrographic, geochemical and geotechnical analyses show that the Lockhart Limestone of Nizampur basin is a potential source of aggregate for the construction industry.