

Physico-Mechanical Properties of Dir-Volcanics and Its Use as a Dimension Stone from Kohistan Island Arc, North Pakistan

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Abstract : Dimension stone is used in construction since prehistoric time; however, its use in the construction has gained significant attention for the last few decades. The present study is designed to investigate the physical and strength properties of volcanic rocks from the Kohistan Island Arc to assess their use as dimension stone. On the basis of the composition, color and texture, five varieties of andesites (MMA, PMA-1, PMA-2, CMA and FMA) and two varieties of agglomerates (AG-1 and AG-2) were identified. These were characterized in terms of their petrography (compositional and textural), physical properties (specific gravity, water absorption, porosity) and strength properties (Unconfined compressive strength and Unconfined tensile strength). Two non-destructive tests (Ultrasonic pulse velocity test and Schmidt Hammer) were conducted and the degree of polishing was evaluated. In addition, correlation analyses were carried out to establish possible relationships among these parameters. The presence of chlorite, epidote, sericite and recrystallized quartz showed the signs of low-grade metamorphism in andesites. The results showed feldspar, amphibole and quartz imparted good physical and strength properties to the samples MMA, CMA, FMA, AG1 and AG2. Whereas, the abundance of alteration products such as chlorite, sericite and epidote in PMA-1 and PMA-2 reduced the physical and strength properties. The unconfined compressive strength showed a strong correlation with ultrasonic pulse velocity, dry density, porosity and water absorption. The values of ultrasonic pulse velocity and Schmidt hammer were considerably affected by the weathering grade. The samples PMA-1 and PMA-2, due to their high water absorption and low strength values, were not recommended for use in load-bearing masonry units and outdoor applications. Whereas, the excellent properties, i.e. high strength and good polishing, the samples, FMA and MMA suggested their use as a decorative and facing stone, in the external pavement, ashlar, rubbles and load-bearing masonry units etc.

Keywords : Physico-mechanical properties, Volcanic rocks, Kohistan Island Arc, Pakistan

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