

Theme 04: Geotechnical engineering & natural hazards

Micropetrographic Analysis and Rock Durability Assessment of Granitoids from North Pakistan

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Weathering and durability are essential factors that determine the suitability of rocks for engineering and construction applications. These properties influence the long-term performance and stability of rocks under diverse environmental conditions and load scenarios. Given the complexity of rock behavior, relying on a single test is insufficient to comprehensively evaluate their suitability. Instead, a combination of physical, mechanical, and chemical tests and indices is commonly employed to ensure a thorough and reliable assessment. Among these, the evaluation of weathering and durability properties, alongside rock strength, is critically important. This study focuses on the application of the micropetrographic index and various rock durability indicators, including both dynamic and static properties, to evaluate the weathering state and durability of granitoids. The indices are developed through an integrated methodology involving petrographic analysis and a series of physico-mechanical tests. Additionally, the slake durability index (SDI) is employed, as it exhibits strong correlations with both static and dynamic durability indicators, providing valuable insights into the strength and durability of the rocks.

This research examines eight granitoid types from Northern Pakistan, specifically Kesu Granodiorite, Warai Granodiorite, Ambela Granite, Garam Chashma Granite, Kumrat Granodiorite, Warsak Syenite, Malakand Granite, and Utla Granite. The micropetrographic index, derived from a detailed petrographic examination, is systematically correlated with physical and mechanical properties to establish reliable durability indicators. This study highlights the utility of these indices in classifying granitoids into distinct weathering and durability categories. Furthermore, the study explores the estimation of durability indices by combining the slake durability index with the micropetrographic index for improved reliability. Comprehensive testing of the granitoids reveals that integrating these indices provides a dependable framework for evaluating rock performance and categorizing weathering states. The findings enhance the understanding of the engineering properties of granitoids, offering a practical approach for their optimal utilization in construction and geotechnical projects.

Keywords: Micropetrographic index; Rock durability indicators; Weathering; Durability