Estimation of rock mechanics from the intrinsic characteristics: A time- and cost-effective approach

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The intrinsic properties of rocks including size, shape and mutual arrangement of mineral grains, are effectively used in deciphering the geological events and deformational history of rocks. A series of experimentation has been executed on multiple rocks suites from the large- and small- scale construction projects in northern Pakistan, to use these intrinsic properties in addressing the mechanical nature of rock. The primary rock suites considered for this study include granite, granodiorite, dolerites, limestones, quartzites, gabbronorite, amphibolite and granulites. These rocks are investigated due to their stability in variety of conditions as well as their wide range of applications in multiple engineering operations. Detailed hand specimen and petrographic examination of these rocks provide ample understanding on their respective textural distinctions. Petrographic examination after the mechanical testing of rocks have also been conducted for some rock types to investigate the propagation of novel stress-induced fracturing and their interaction with mineral grain boundaries. The statistical comparison is made between the mechanical nature and textural relations of rocks which yields important insights. The grain size and shape, grain boundaries relations, variation in grain size within a rock, alignment and recrystallization of mineral grains are important characteristics to be controlling the mechanical nature of rocks. All the mentioned features collectively contribute to govern the mechanical response of rocks.