The Mineralogy of Shales from the Pilbara and How Chemical Weathering Affects the Intact Strength

Authors : Arturo Maldonado

Abstract : In the iron ore mining industry, the intact strength of rock units is defined using the uniaxial compressive strength (UCS). This parameter is very important for the classification of shale materials, allowing the split between rock and cohesive soils based on the magnitude of UCS. For this research, it is assumed that UCS less than or equal to 1 MPa is representative of soils. Several researchers have anticipated that the magnitude of UCS reduces with weathering progression, also since UCS is a directional property, its magnitude depends upon the rock fabric orientation. Thus, the paper presents how the UCS of shales is affected by both weathering grade and bedding orientation. The mineralogy of shales has been defined using Hyper-spectral and chemical assays to define the mineral constituents of shale and other non-shale materials. Geological classification tools have been used to define distinct lithological types, and in this manner, the author uses mineralogical datasets to recognize and isolate shales from other rock types and develop tertiary plots for fresh and weathered shales. The mineralogical classification of shales has reduced the contamination of lithology types and facilitated the study of the physical factors affecting the intact strength of shales, like anisotropic strength due to bedding orientation. The analysis of mineralogical characteristics of shales is perhaps the most important contribution of this paper to other researchers who may wish to explore similar methods.

Keywords : rock mechanics, mineralogy, shales, weathering, anisotropy
Conference Title : ICCGE 2024 : International Conference on Civil and Geological Engineering
Conference Location : Berlin, Germany
Conference Dates : May 16-17, 2024