Review of the effect of corrosive environment on rock mechanical property

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# ABSTRACT

With the increasing complexity and broader scope of engineering projects, the effect of extreme environments, such as corrosion, on rock is extensively studied. It has a critical effect on rock's mechanical and physical properties. And the change of mechanical properties of rocks in corrosive environments has garnered considerable attention due to their relevance in diverse mining extractions and geological explorations.

Natural rocks usually encounter groundwater and precipitation. Common environments with water presence are prone to chemical corrosion. The mechanical properties of rocks are notably influenced by the chemistry of water in the environment. Both geological and industrial activities can influence the pH levels of rain and groundwater. Usually, the pH of acid precipitation changes between 4 - 7. Meanwhile, the pH of groundwater in sulphide mines, hard rock mines and nuclear waste storage regions typically varies between 2 and 11. While in high latitude and seasonally frozen areas, as well as in deep ground, chemical corrosion may occur at various temperatures. High temperature, low temperature, and thermal change in corrosive environments can also significantly impact rock's mechanical properties. And they are commonly encountered. Therefore, understanding the rocks in corrosive environments is a significant necessity.

This review paper commences with an introduction to representative corrosive environments. Followed by the chemical reactions and microscopic exploration lead to alterations in rock's mechanical properties. This involves clarifying the relationships between SO42-, Cl-, OH-, H+, and rock and elucidating their influence on rock strength and stability. Certain minerals would react and dissolve in the solution. Subsequently, the effects of cyclic and dynamic loads on corroded rock are reviewed. Furthermore, this paper delves into the intricate interplay between temperature fluctuations and corrosive agents. Finally, it identifies research gaps and offers critical insights based on current studies.