Brazilian Tensile Strength Tests and Numerical Simulation Study on Carbonaceous Slate with Different Weak Interlayer Dip Angles (Postprint)

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Abstract

To investigate the influence of weak interlayers on the tensile mechanical properties of carbonaceous slate, Brazilian tensile strength tests were conducted on carbonaceous slate containing weak interlayers with different inclination angles to study the influence laws of weak interlayers and their inclination angles on the tensile strength, load-displacement curves, and failure modes of carbonaceous slate, and numerical simulation analysis was performed using the ABAQUS finite element software to establish a cohesive zone model. The research results indicate that: the tensile strength of carbonaceous slate with different weak interlayer inclination angles exhibits significant anisotropy; as the weak interlayer inclination angle increases, the tensile strength first decreases and then increases, roughly following a "U-shaped" distribution; during the splitting process of carbonaceous slate with different weak interlayer inclination angles, the evolution of axial load with displacement exhibits three stages: compaction, quasi-elastic, and failure; the failure modes of carbonaceous slate with different weak interlayer inclination angles can be divided into three types: tensile cracking failure, shear failure, and tensile-shear mixed failure; numerical simulation of the Brazilian tensile strength tests on carbonaceous slate with different weak interlayer inclination angles was conducted using the cohesive zone model, and the failure modes and mechanical behavior of the model both show good agreement with the experimental results, and are sensitive to the cohesive element parameters.

Full Text

Preamble

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Note: Figure translations are in progress. See original paper for figures.