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Mechanical Properties and Behavior of Early-Age Fiber-Reinforced Cemented Paste Backfill

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Abstract **-** Cemented paste backfill (CPB, a mixture of tailings, cement, and water) has been extensively adopted in underground mines around the world. As a major underground support measure, CPB is required to provide sufficient ground support to the underground mined-out space (called stopes). To improve the mechanical behavior of CPB, fiber reinforcement technique has been considered as a promising approach. However, as the key design parameters, mechanical properties, and behavior of fiber-reinforced CPB (FR-CPB) have not been systematically investigated. This study aims to experimentally investigate the tension and compression behavior of FR-CPB and associated mechanical properties including elastic modulus, tensile strength, and unconfined compressive strength at early-age curing time (1, 3, and 7 days). Moreover, an experimental program was designed and performed to measure the electric conductivity and matric suction in FR-CPB. The monitored results were used to explain the evolution of the mechanical properties and behavior of FR-CPB. The obtained results show that a significant improvement of mechanical properties and behavior of CPB has been achieved due to the fiber inclusion in the CPB matrix. Moreover, the FR-CPB shows an enhanced energy absorption to resist material failure. Additionally, the substantial improvement of mechanical properties and behavior (hardening and softening stages) at early-age curing time indicates the key role played by the cement hydration in the CPB matrix. The obtained results from the present study can improve the understanding of the mechanical behavior of FR-CPB and thus contribute to the successful implementation of the fiber reinforcement technique.

Keywords**:** Cemented Paste Backfill; Tailings; Fiber Reinforcement; Mechanical Behavior.