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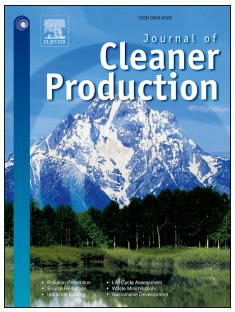

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Recycling phosphogypsum and construction demolition waste for cemented paste backfill and its environmental impact

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Abstract Solid waste management has become an important global issue, and the collection, recycling, and disposal of solid waste have great environmental impacts. This study investigates the feasibility of recycling two different solid wastes, phosphogypsum (PG) and construction demolition waste (CDW), as cemented paste backfill (CPB). The properties of the CPB were first demonstrated through a slump test, setting time detection and unconfined compressive strength (UCS) tests, and microstructural analysis. The environmental impact of the PG and CDW-based CPB was investigated through a static leaching experiment, a rotary acid leaching procedure, and index detection. A novel backfill system and process was also developed for engineering applications. The results show that (1) the solid concentration of CPB increased from 60 wt.% to 70 wt.% and the initial/final setting time decreased to 20-30% with the addition of CDW (from 0 wt.% to 40 wt.%); (2) the UCS of the CPB samples after 28 days of curing reached 1.74 MPa at 40 wt.% CDW proportion, a cement/sand ratio of 1:6, and 70 wt.% solid concentration; (3) the CPB samples had a high residual strength (80% of the UCS), indicating that PG and CDW-based CPB can support an underground stope after failure; and (4) the environmental indices for the bleed water and leachates of CPB satisfied the