Special Issue

Backfill-Integrated Water-Conserving Green Mining Technology in Coal Mining

Message from the Guest Editor

Backfill-integrated water-conserving green mining technology represents a sustainable approach that synergizes solid backfilling methods with water resource protection. By utilizing waste materials such as gangue, fly ash, and tailings as backfilling media, this technology minimizes surface subsidence and groundwater depletion while also reducing the environmental footprint of mining. A key innovation lies in its ability to preserve aquifers by replacing traditional caving methods with dense backfill bodies, effectively isolating water-bearing strata and preventing water loss or contamination. The integration of water-saving strategies includes optimizing backfill mixtures to enhance permeability control and incorporating closed-loop water systems for material preparation, reducing freshwater consumption.

Challenges remain in improving backfilling efficiency, refining material recipes (e.g., using industrial wastewater as mixing water), and deploying intelligent equipment to automate processes. Future advancements in smart technologies and eco-friendly materials will further solidify the role of backfill-integrated water-conserving green mining technology in green mining.

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