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Special Issue Reprint

Monitoring, Process Control, Simulation, and Optimization in Coal Mining

Edited by: Yangyang Guo, Bo Li and Wei Zhao

The contributions in this Special Issue highlight advances in understanding dynamic disasters, coal mine gas behavior, gas extraction in low-permeability seams, gas explosions, and adsorption and desorption processes. The contributions provide comprehensive insights into the mechanisms of dynamic disasters, including coal–rock failure, rockbursts, and outburst-prone structures, which are critical for improving safety in deep and complex mining environments. Research on coal bed gas adsorption, desorption, diffusion, and emission has clarified the factors influencing gas migration and over-limit events, supporting more accurate risk assessment and early warning strategies. Studies on gas extraction technologies and permeability enhancement methods offer practical solutions for low-permeability coal seams, including hydraulic slotting, borehole sealing, and unloading techniques, improving gas drainage efficiency and mitigating disaster risks. Furthermore, investigations into mining process control, roadway layout optimization, and filling operations demonstrate the effectiveness of engineering strategies and numerical simulations in enhancing operational safety and extraction efficiency. Together, these contributions provide valuable guidance for future research and practical applications in coal mine safety and process optimization.

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