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Special Issue Reprint

Simulation, Experiment and Modeling of Coal Fires

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This Special Issue brings together 12 pioneering articles dedicated to an in-depth analysis of coal fires, a global disaster, through various research paradigms including simulation, experimentation, and modeling. The content focuses on three core areas: i. At the microscopic mechanisms level, it investigates the effects of solvent extraction on the functional groups and molecular structures of coal, combined with thermodynamic analysis, to fundamentally reveal the physicochemical properties of spontaneous combustion. ii. In the field of monitoring and early warning, it presents advanced monitoring solutions ranging from optimizing traditional gas indicators to deploying Distributed Temperature Sensing Systems, while innovatively applying artificial intelligence models such as deep learning for the precise prediction of secondary disasters like gas explosion. iii. Regarding engineering prevention and control, it investigates airflow leakage patterns in gob areas under advanced mining techniques, proposing targeted, field-verified sealing and fire prevention strategies. The Special Issue also includes comprehensive reviews on the research landscape and looks forward to exploring innovative pathways for recovering and converting waste heat from fire zones using a combined device of TPCTs and TGs, presenting a new vision that integrates disaster management with resource utilization. Collectively, the research in this Special Issue provides a vital theoretical and technical foundation for understanding the mechanisms of coal fires, and for achieving their precise prevention, control, and sustainable governance.



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