



**minerals**

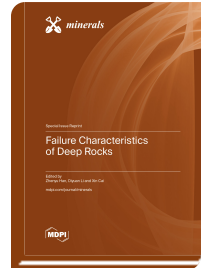


*Special Issue Reprint*

## **Failure Characteristics of Deep Rocks**

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Edited by  
Zhenyu Han  
Diyuan Li  
Xin Cai



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This Special Issue, *Failure Characteristics of Deep Rocks*, presents a focused collection of research on rock failure mechanisms in deep geological environments. As engineering projects like mining, tunneling, geothermal energy extraction, and carbon storage push deeper, challenges involving high stresses, elevated temperatures, and complex geological structures necessitate deeper insights into rock behavior. These studies explore the mechanical properties of deep rocks, including strength, deformation, and brittleness, and examine how strain rate and confining pressure influence failure modes. Detailed attention is given to crack initiation, propagation, and the transition from micro-cracking to macroscopic fracture, highlighting stress redistribution and fracture coalescence. Coupled thermal, hydraulic, and mechanical processes are also analyzed, demonstrating their impact on rock instability under extreme conditions. Practical applications include strategies for safer underground excavation, the mitigation of rockbursts, and improved reservoir stability during energy production. Innovative experimental techniques, such as advanced triaxial testing under ultra-high pressures and cutting-edge numerical simulations, provide robust tools for predicting and managing rock failure. This multidisciplinary collection bridges fundamental research with engineering applications, offering critical insights to enhance the safety, efficiency, and sustainability of operations in deep geological settings.



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