

Is polymer rubber a viable sealing material for lined rock caverns?

Polymer rubber are considered viable sealing materials for lined rock caverns (LRC) in compressed air energy storage (CAES) systems. However, the mechanical stability and long-term durability of the rubber sealing layer are substantially impacted by the air temperature and pressure within the cavern.

Does a rubber sealing layer reduce energy waste?

The results indicate that the rubber sealing layer reduces energy waste and mitigates stress induced by temperature and pressure within each structural layer compared to the steel sealing layer.

Is compressed air energy storage a viable option for large-scale energy storage?

Pumped hydroelectric storage (PHS) and compressed air energy storage (CAES) are two viable options for large-scale energy storage systems. However, due to geographical limitations, construction costs, and other factors, PHS may no longer be sufficient to meet the demand for peak regulation caused by the rapid development of new energies.

Does rubber seal ensure mechanical stability during 60 days of Operation?

From the perspective of magnitude, the circumferential tensile strain under each state is smaller than the elongation at break of butyl rubber. This shows that the rubber seal can ensure mechanical stability during 60 days of operation. Fig. 26. Radial strain of rubber sealing layer in the first cycle and 60th cycle. 6.2.2.

Does a rubber sealing layer have a mechanical tensile and cyclic loading?

In this study, a hyperelastic damage constitutive model was proposed to characterize the mechanical behavior of the rubber sealing layer. Aging and mechanical experiments were conducted to investigate the uniaxial tensile and cyclic loading characteristics of aged and unaged rubber samples, along with the microscopic damage behavior.

What is the long-term evolution of a rubber sealing layer?

The long-term evolution of stress, strain, displacement, and damage state in the rubber sealing layer was evaluated under three conditions: no damage, pressure-induced damage, and coupled pressure-temperature damage.

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