Energy storage conditions of rocks

Does energy storage occur within a rock material?
In theory, energy storage or dissipation occurs within a rock material provided that there must be an input of energy. In other words, when the external input energy is zero, both the internal elastic energy and the dissipative energy are zero. Therefore, the point (0, 0) was added to Fig. 9 for the data fitting.

Are rocks more suitable for storage involving high-temperature application?
Nevertheless,rocks have the ability to hold higher temperatures than water and have relatively higher density. 27 Hence,rocks may be more suitable for storage involving high-temperature application. Heat stored in sensible thermal energy storage and latent thermal energy storage.

What happens if energy flows into rocks with a strong energy storage capacity?
When the energy flows into rocks with relatively strong energy storage capacity,the input energy tends to be stored in the form of elastic energy. For rocks with weaker relative energy storage capacity,the input energy is more likely to be used for plastic deformation and grain friction.

Does a rock's end shape affect the energy storage potential?
Under similar stress conditions,it was found that the end shape of rock specimens with equal height affected the ultimate energy storage potential,whereas it showed a negligible influence on the relative energy storage potential. The energy release potential of the five types of rocks was experimental evaluated.

What is the relative energy storage potential of a rock?
The relative energy storage potential of the five types of rocks tested obeys the sequence from strong to weak: limestone > Miluo granite > red sandstone > green sandstone > white marble (the values of au are 0.8584, 0.8082, 0.7652, 0.6975, and 0.5600, respectively). Fig. 8.

What is the maximum energy stored in a rock specimen?
In general,a limit of energy accumulation for a rock specimen exists before its stability is lost,which represents the maximum energy stored in a rock specimen before reaching its critical destructive point. The maximum energy stored is termed the ultimate internal elastic energyEe in this paper.

The integration of thermal energy storage (TES) systems is key for the commercial viability of concentrating solar power (CSP) plants [1, 2].The inherent flexibility, enabled by the TES is acknowledged to be the main competitive advantage against other intermittent renewable technologies, such as solar photovoltaic plants, which are much ...

Thermal energy storage is crucial in improving the utilization efficiency of intermittent renewable energy. Conventional analytical solutions to solve transient heat conduction problems have been limited to underground mine rocks during thermal energy storage application, due to multilayer rock formations and

periodical temperature boundary conditions.

Sandstone or carbonate is the most common types of aquifer rock formations. The geology conditions of a suitable aquifer for gas storage are similar to those of depleted gas reservoirs. ... Physical simulation of construction and control of two butted-well horizontal cavern energy storage using large molded rock salt specimens. Energy, 185 ...

Johansson et al. [20] have pointed out that LRC is a method most suitable for utilizing underground space for storage under conditions of hard rock geology. The main components of LRC include a steel plate for sealing, an asphalt sliding layer, reinforced concrete lining, drainage system, and specialized shotcrete at the interface with the ...

A higher (lower) crack initiation (damage) ratio in coal reflects its faster crack propagation than sandstone. Energy evolution analysis shows that coal has a poorer elastic energy storage capacity, but its energy dissipation is severer. The energy-type catastrophe criteria for coal and sandstone are derived based on an elastic energy ratio.

Granite is a promising candidate for rock-based thermal energy-storage systems because of its excellent thermal conductivity and heat capacity. The coarse-grained granite used in this study was procured from Changsha, China. ... demonstrating that this method provides the possibility for conducting work under conditions that are unattainable ...

1. Introduction. Hydrogen is a clean, efficient, and renewable secondary energy with high-energy-density per unit mass. It can be produced by electrolysis of water, biomass conversion, industrial by-product hydrogen, and other ways [1].The comprehensive utilization of hydrogen energy is an important node for human beings to change from developing energy to ...

Thermal Energy Storage (TES) gaining attention as a sustainable and affordable solution for rising energy demands. ... In a deep geothermal storage system, heat is extracted from rocks several kilometers underground. The deep well must be drilled to reach the high-temperature reservoirs [5]. ... The hydrogeological conditions are primarily to ...

From an energy viewpoint, to avoid the occurrence of fragment bursting, a support of pillar rock should be capable of absorbing the rock kinetic energy originated from the residual elastic energy in pillar rock. 47 Therefore, the estimation of energy storage and release potentials of rock pillars considering the shape effect has a direct ...

The team found that the Craton soapstone performed best as a thermal energy storage rock. It absorbed, stored and transmitted heat effectively while staying stable and strong. This makes it ideal for electricity storage applications. The other rocks could be used for a lower-energy application, such a solar food dryer.

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To investigate the energy evolution and storage performances of rock under uniaxial cyclic compression, a series of uniaxial cyclic loading and unloading compression tests were conducted on Green ...

Rockburst is a kind of rock failure phenomenon during which the internal elastic strain energy of surrounding rock mass is released dynamically under external load, and the loading rate is an essential influencing factor of potential for bursting. To investigate the effects of loading rate on rockburst proneness from energy storage and surplus perspectives, ...

As underground excavations become deeper, violent rock failures associated with the sudden release of elastic energy become more prevalent, threatening the safety of workers and construction equipment. It is important to figure out the energy-related failure mechanisms of rocks. However, the energy evolution across the complete deformation of ...

Brenmiller"s award-winning TES technology is a "thermal battery" using crushed rocks to store high-temperature useful heat. Powered by renewable energy the system generates carbon-free steam, hot water or hot air for on-demand usage at your facility.

The results obtained indicated that Hong Kong basalt is the optimal candidate for high-temperature thermal energy storage material, with 850 °C identified as the suitable maximum working temperature. Other igneous rocks from Hong Kong can be utilized for mid-to-low temperature range (100-500 °C) thermal energy storage engineering.

To investigate the effects of different unloading rates on rockbursts, the conventional triaxial compression tests and confining pressure unloading tests have been conducted on rock samples. The variation law of stress and stress thresholds for structural failure of rock sample under different confining pressures was analyzed, and the influence of different ...

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