Sandstone thermal energy storage

During oil and gas exploitation in tight sandstone reservoirs, the influence of temperature on the physical and mechanical properties of sandstone cannot be ignored, which is of great significance to the formulation of oil and gas exploitation techniques and the accurate evaluation of recovery. In this article, the physical and mechanical properties of sandstone after ...

The geological thermal energy storage (GeoTES) technology envisions injection of surface-heated water into a geologic unit at depth to store excess heat energy during periods of low energy demand and subsequent extraction of the stored heat for consumption during periods of high energy demand. ... The Weber Sandstone is a fine-grained quartz ...

Packed bed thermal energy storage system is one of the promising solutions to store energy from the renewable power generation plants in the form of thermal energy. The selection of storage material is an important factor for the efficient functioning of the packed bed storage system. In this study, sandstone has been chosen as a storage material because of its good ...

Natural rock is considered a solution for thermal energy storage (TES). comprehensive understanding of the effect of high temperature on the physical and mechanical properties of rock has an important effect on the carbon footprint. The novelties of this paper are as follows. First, the influence of high temperature on the distribution characteristics of ...

Thermal energy storage (TES) systems can store heat or cold to be used later, at different temperature, place, or power. The main use of TES is to overcome the mismatch between energy generation and energy use (Mehling and Cabeza, 2008, Dincer and Rosen, 2002, Cabeza, 2012, Alva et al., 2018).The mismatch can be in time, temperature, power, or ...

The geological thermal energy storage (GeoTES) technology envisions injection of surface-heated water into a geologic unit at depth to store excess heat and extract that stored heat for consumption when energy demand is high. ... The Weber Sandstone is a fine-grained quartz arenite with bimodal grainsize distribution. This formation in Rock ...

Sandstone rocks are believed to be suitable reservoirs for SRTES due to their thermal properties and abundance, and several authors have suggested their use in this application [7 - 11]. Sandstones offer multiple advantages as reservoir rocks for geothermal energy and underground thermal energy storage applications.

Thermal energy storage (TES) system is a decisive technology for handling intermittent problems, and ensuring the dispatchability of electrical energy from concentrated ...

There are various thermal energy storage systems available; one of the most basic is sensible thermal energy

storage which includes rock thermal energy storage (RTES). ... and quartzitic sandstone ...

Underground Thermal Energy Storage (UTES) is a sensible TES method, characterized by high storage efficiencies [6], [7] and high storage capacities and is therefore the preferred choice for long-term TES. ... Deeper systems typically utilize sandstone or highly fractured rock [199]. The suitability of the subsurface depends on several ...

The dynamic tensile strength of rocks affects structural stability in geotechnical applications requiring thermal resilience. This study employs a large-diameter (F75 mm) split Hopkinson tension bar (SHTB) to perform high-strain-rate tensile tests on red sandstone specimens subjected to thermal treatments at temperatures up to 1200 °C.However, ...

Subsurface rocks are ideal for thermal energy storage, as they can store energy generated by solar and wind plants. Sandstone rocks are believed to be suitable reservoirs for SRTES due to their thermal properties and abundance, and several authors have suggested their use in this application [7 - 11].

It is expressed as the amount of heat that flows through a unit area of a material in a unit of time when a temperature difference exists across the rock. The thermal conductivity of sandstone rocks can range from 0.5 W/m · K to 6 W/m · K depending on factors like porosity, cementation, grain size/shape, and mineralogy [22].

A shale layer overlaying a sandstone formation, for example may be suitable. Equally important will be siting regions away from faults, again to prevent hot water migration out of the created geothermal reservoir. ... Geologic thermal energy storage of solar heat to provide a source of dispatchable renewable power and seasonal energy storage ...

One of the grid-scale energy storage technologies that is currently being explored is geologic thermal energy storage (GeoTES). ... batch-type water-rock interaction experiments using reservoir rock from the Weber Sandstone, and a synthetic formation brine. The Weber Sandstone is a fine-grained arenite, mostly comprised of quartz (95%), with ...

The Weber Sandstone is a fine-grained quartz arenite with bimodal grainsize distribution. It is mostly comprised of quartz (95%), with calcite, dolomite, and anhydrite cements. ... Geochemistry of geologic thermal energy storage (GeoTES) systems: Assessment of the weber sandstone, western Wyoming, USA. / Neupane, Ghanashyam; Smith, Robert W ...

As shown in Figure 3, the two basic TES mechanisms are sensible thermal energy storage (STES) and latent thermal energy storage (LTES). 23 Another option is utilizing thermochemical storage (TCS) or combination and alterations of these three techniques. 24-26 The working principle of STES is storing thermal energy by using a temperature ...

Reservoir--Thermal Gravity Sandstone Nonpotable aquifer Shale and coal Salt Shale Salt dome Shale Potable aquifer Sandstone Shale ... and thermal geologic energy storage methods in potential underground settings in a sedimentary basin. Most of these geologic settings could be used for more than one form of energy storage (fig.). Nevertheless ...

Latent heat thermal energy storage addresses the mismatch between energy supply and demand; however, phase change materials (PCM) commonly have the issue of low thermal conductivity. ... Basalt causes the highest energy storage rate, followed by gneiss, granite, marble, quartzite, and sandstone. The increase in the energy storage rate is more ...

This knowledge can be used to optimize the understanding of the potential of sandstone reservoirs in applications, such as geothermal energy or thermal energy storage. Experimental workflow of ...

The thermal energy in the working face can be transferred to surrounding rock ... X. et al. Experimental study on mechanical properties of gas storage sandstone and its damage under temperature ...

High-temperature aquifer thermal energy storage (HT-ATES) systems are designed for seasonal storage of large amounts of thermal energy to meet the demand of industrial processes or district heating systems at high temperatures (> 100 °C). The resulting high injection temperatures or pressures induce thermo- and poroelastic stress changes ...

These latter influence the rock properties and thus it could have a direct effect on their thermal behavior. These are precisely the reasons why some types of rocks may be more suitable than others for thermal energy storage applications.

The Sandstone Solar Energy Project was an up to 1,600 megawatt (MW) solar thermal power project with 16 gigawatt-hours of energy storage, [2] planned just to the east of Tonopah, about 170 miles (270 km) northwest of Las Vegas.The project was about up to eight 200 MW solar towers with integrated molten salt energy storage technology. The project, developed by ...

facility can provide bulk energy with system inertia serving both energy and ancillary markets. 2) What is the target size/scale of the energy storage technology/module/system? What is the target for storage duration? (e.g., 4h, 10h, 24h+) This system is intended to provide GWhs of storage at durations up to 24 hours.

Thermal Energy Storage (TES) gaining attention as a sustainable and affordable solution for rising energy demands. ... In a sandstone reservoir, water is injected at 85-90 °C at 28 l per second. The initial groundwater found in the sandstone had a temperature of 55 °C and a TDS of 135 g per kilogram. The ATES was unloading at 70 °C; hence ...

This dissertation aims to evaluate the thermal performance of sandstone reservoirs for thermal energy storage applications. The research encompasses a comprehensive experimental ...

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The storage of heat in aquifers, also referred to as Aquifer Thermal Energy Storage (ATES), bears a high potential to bridge the seasonal gap between periods of highest thermal energy demand and supply. ... A second storage formation (sandstone) is considered in a depth of around 1000 m [48]. Again, different heat sources and sinks as well as ...

Even though each thermal energy source has its specific context, TES is a critical function that enables energy conservation across all main thermal energy sources [5] Europe, it has been predicted that over 1.4 × 10 15 Wh/year can be stored, and 4 × 10 11 kg of CO 2 releases are prevented in buildings and manufacturing areas by extensive usage of heat and ...

The thermal properties of sedimentary rocks, such as thermal conductivity, thermal diffusivity, and volumetric specific heat, play a critical role in their suitability for these applications. This study examined the thermal properties of 30 different sandstone rock samples using scanning electron microscopy (SEM) analysis.

THERMAL SCIENCE: Year 2023, Vol. 27, No. 3B, pp. 2525-2536 2525 ENGINEERING PRACTICE OF GEOTHERMAL RECHARGE TECHNOLOGY FOR LELING SANDSTONE THERMAL STORAGE by Hongyan LI a,ba,b*, Jiangfeng WANG a,ba, Bin LIU, and Pengtao WANG a School of Energy and Power Engineering, Xi"an Jiaotong University, Xi"an, China