

How much entropy is produced in a shock wave?

The entropy production in the weak and strong shocks were approximately proportional to the square of the Mach number and decayed with time at approximately the same relative rate. In both cases, some 97% of the total entropy production in the gas occurred in the shock wave.

How does shock compression affect energy storage and heat dissipation?

Energy storage and heat dissipation under shock compression are investigated and the microscopic mechanics are revealed. Total deformation is decomposed into elastic and plastic parts based on the model of four decoupling configurations.

How does ZIF-8 dissipate shock waves?

We find that shock wave dissipation by ZIF-8 occurred by multiple processes: powder compaction, nanopore-collapse, and chemical bond-breakage. The shock energy absorbance in ZIF-8 is proportional to ZIF-8 thickness, allowing the prediction of the thickness of MOF layer needed to attenuate shock waves to a desired lower energy.

Does shock wave structure exhibit a distinguishable two-wave structure?

The shock wave structure for the orientation does not exhibit a distinguishable two-wave structure, namely elastic precursor wave and plastic wave, as shown in Fig. 5. The underlying mechanism was investigated in a previous study and is not discussed here. This work focuses on energy dissipation and storage of plastic work.

Does shock compression affect energy storage and dissipation in single copper crystals?

Conclusions MD simulations were employed to investigate energy storage and dissipation in two typical orientations of single copper crystals during shock compressions. The deformation at the atomic scale was decomposed into elastic and plastic deformation using a theoretical framework to decouple elastic-plastic deformation.

Is a shock wave a surface of discontinuity?

We have considered a shock wave as a surface of discontinuity and computed the entropy production using nonequilibrium thermodynamics for surfaces.

As shown in Fig. 6 (a), the shock wave energy at 0.3 m is proportional to the length of the aluminum wire, but the growth trend of shock wave energy turns gradually gentle when the length of the aluminum wire is 60~70 mm, and the minimum shock wave energy is about 56.57 J, the maximum is about 228.18 J; As the length of the aluminum wire ...

Shock wave induces boundary layer separation when back pressure is set at the nozzle outlet. However, the effects of the complex flow characteristics on energy conversion mechanisms and the non-equilibrium phase transitions are not fully understood. This study developed a physical model for the homogeneous condensation

of water vapour. The accuracy ...

The force-electric effect in ferroelectrics is characterized by the release of bound charge during pressure/shock-induced depolarization. In contrast to other electrical energy storage systems, the charge-storage/release by the force-electric effect of ferroelectrics is determined by polarization switching or polar-nonpolar phase transition. This offers a further ...

Here, we report that a ferroelectric ceramic, (NBT), can generate a high power output under shock compression, which is one of the highest values achieved by the force ...

Before considering the physical processes, it is helpful to have a general understanding of UEWE from a circuit point of view. Figure 1(a) shows a typical setup of a UEWE system, where the pulsed current is generated by an ...

On the basis of traditional liquid electric effect and metal wire electric explosion unblocking technology, assisted by energetic materials, a repeated shaped energy shock ...

Mechanical energy as a function of storage pressures in a tank of 72.4 ... Indeed, a shock wave propagating outwards from the tank through air generates a mixing of flammable gas (hydrogen) with air at the contact surface between gas and air due to high flow velocity behind the shock. The partially premixed combustion will take place, which ...

Based on the observed electrochemical properties, shock wave loaded CoFe_2O_4 NPs are strongly suggested for energy storage applications. 1. Introduction.

Shock-wave energy is dissipated by heat dissipation, viscous retardation, and plastic dissipation. The two-phase structure must obey deformation coordination, which results in more strain energy and internal friction. ... The master curves reflect the excellent energy storage and dissipation properties of the polyurea under small deformation.

At a specific energy storage of 500 J, as the wire diameter increases, more energy will be used to vaporize the wire (but less current density), resulting in a different appearance. ... et al., Shock wave energy: explosions in air, ground, and water, in 30th International Symposium on Shock Waves, vol. 2 (2017), pp. 1307-1311. Google Scholar ...

Two cases were studied, a weak shock with Mach number and a strong shock with and with a Prandtl number of the gas in both cases. The four theoretical methods gave ...

Herein, we describe the solid-state fusion of rod-shaped to honeycomb-shaped cadmium oxide particles (CdO NPs) caused by the process of repeated exposure to acoustic shock waves. Significant changes have been observed in structurally and morphologically dependent properties. For instance, at the 200-shocked condition,

the high-pressure CdO-B2 ...

Energy flux density is defined as the shock wave energy which flows through an area perpendicular to the area of propagation per unit area. The energy flux density is measured in mJ/mm^2 . It is equal to the time integral over the square of the local pressure divided by the product of the density and the ...

1 Nov 2023 | Journal of Energy Storage, Vol. 72. Droplet Size Impact on n-Heptane Detonation. 21 November 2023 | Combustion, Explosion, and Shock Waves, Vol. 59, No. 5. Spray-cooled compression: theory and simulation. 1 Apr 2023 | Applied Thermal Engineering, Vol. 4. Effects of dilute coal char particle suspensions on propagating methane ...

wave pressure and impulse both vary as distance divided by the one-third power of the blast wave energy. The nondimensionalized distance of a target from the energy release center is given by $R = R(p_0/E)^{1/3}$ [C.1] where R is the distance from energy source (m), R is the nondimensional distance, p_0 is the ambient pressure (kPa), and E is the ...

The energy storage density could be improved by 138% with the cost of 21% reduction in COP (coefficient of performance), which is defined as the ratio of the useful heat output to the total heat input to charge the storage system. 2.2. Single-stage absorption thermal energy storage with crystallization.

blast wave generated by a high-pressure gas storage tank rupture in a fire. An overview of existing methods to calculate stored in a tank internal (mechanical) energy and a blast wave decay is presented. Predictions by the existing technique and an original model developed in this study, which accounts ... Mach number of the shock wave

In this paper, for a triangular prism-type energy converter, the SWs distribution, near the energy converter and generated by the discharge of aluminum wires with diameters ...

Shock wave recovery experiments on a-V 2 O 5 nano-crystalline materials: A potential material for energy storage applications. Author links open overlay panel A. Sivakumar a, S. Sahaya Jude Dhas b, P. Sivaprakash c d, A. Dhayal Raj e, Raju Suresh Kumar f, S. Arumugam c, S. Prabhu g, R. Ramesh h, Shubhadip Chakraborty i, S.A. Martin Britto Dhas a.

In the storage of loose-packed density, a phenomenon similar to throwing will occur under strong impact stimulation, and it has high ignitability in a large radius, such as the fireball area with a size of $100\text{mm} \times 100\text{mm}$ is larger than 4m. ... it can be obtained that for the TNT ignition source, the shock wave energy is mainly ...

The most serious defect is the low energy efficiency of such a discharge which the energy of shock waves only can reach 8% of the electrical energy stored in capacitors [5]. In order to generate a strong shock wave, the volume of energy storage unit has always be large, and it limits the applicability of this tool.

The peak shock waves vibrational energy occurs in the time domain near 0 s, and at a frequency of 1.07 Hz. The energy of shock waves is concentrated in the frequency domain from 0 to 100 Hz. When concrete fractures, the energy of shock waves is shifted in ...

When determining a place for hydrogen energy storage and injection into vehicles, the main safety concern of hydrogen refueling stations is high-pressure hydrogen leakage. In this paper, the CFD method is used to study the effect of different ignition times on the explosion and shock wave propagation of high-pressure hydrogen gas leakage ...

The thermal decomposition of methane (10 mol% in inert gases) was investigated behind reflected shock waves. Product spectra were measured via GC/MS after reactions with initial temperatures between 1285 and 2400 K at pressures of 1.5 bar in a single-pulse shock tube and of 30 bar in a high-pressure shock tube with rapid gas sampling via a fast opening valve.

3.3 The Impact of Adding Inductance Components on the Shock-wave Generated by the Explosion of Metal Wires in Water. The paper compares the SW when the energy storage capacitor voltage is 9.4 kV, 10.8 kV, 12.8 kV, and 14.4 kV. Their pressure peak, half width and impulse per unit area of SW were compared.

Many scholars have studied the response characteristics of storage tanks under fire. Liu [21] analyzed the impact of blast wave intensity and the explosion center's relative height on steel storage tanks, finding that a tank's fire resistance and critical buckling temperature are reduced when damaged by a blast wave. Li [22, 23] numerically investigated the thermal ...

Shock wave energy absorption in metal-organic framework. J. Am. Chem. Soc. (2019) J. Liua et al. Photocatalytic activity of shock ... Note that similar kinds of results have been observed previously for the potential energy storage materials of ferrites such as cobalt ferrite NPs [54], manganese ferrite [55] and multi-wall carbon nano-tubes ...

Dissipation of cavitation-induced shock waves energy through phase transformation in NiTi alloys. Int. J. Mech. Sci. (2018) ... we systematically investigate the energy storage and heat dissipation in copper single crystals with two typical orientations under shock compression and reveal their microscopic mechanisms using molecular dynamics ...

The design of the self-powered ocean environmental health monitoring system is shown in Fig. 1c. Figure 1c (i) and (ii) illustrate the wave kinetic energy harvesting and conversion modules. As ...

Plasma dynamics in PF-1000 device under full-scale energy storage: I. Pinch dynamics, shock-wave diffraction, and inertial electrode. V A Gribkov 1,2,3, B Bienkowska 1, M Borowiecki 1, A V Dubrovsky 2, I Ivanova-Stanik 1, L Karpinski 1, R A Miklaszewski 1, M Paduch 1, M Scholz 1 and K Tomaszewski 1. Published 16 March 2007 o 2007 IOP ...

In fact, some traditional energy storage devices are not suitable for energy storage in some special occasions. Over the past few decades, microelectronics and wireless microsystem technologies have undergone rapid development, so low power consumption micro-electro-mechanical products have rapidly gained popularity [10, 11]. The method for supplying ...

In this framework, the shock wave recovery experiments have been performed on a -V2 O 5 to assess its crystallographic, electronic and magnetic phase stabilities with respect ...

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