Aluminum alloy deformation energy storage

Does aluminum alloy have high stacking fault energy?
Aluminum alloy has high stacking fault energy,and CDRX mainly occurs in the thermal deformation process at higher temperatures. During the formation of recrystallized grains,the internal energy,deformation energy storage and dislocation density of the alloy provide energy for the transformation of LAGBs,and LAGBs transform to HAGBs.

Does initial deformation affect microstructure and texture of 7085 aluminum alloy?
Yes,initial deformation affects the microstructure and textureof 7085 aluminum alloy. This was investigated through hardness test,conductivity test,x-ray diffraction (XRD) analysis,and electron backscatter diffraction scans (EBSD) measurement. The effect of initial deformation,stored energy,target temperatures,and heating rates on the hardness and conductivity of 7085 aluminum alloy was also studied.

Does hot rolling deformation affect the microstructure and properties of aluminum alloy?
There are few studieson the effects of hot rolling deformation and reduction pass on the microstructure and properties of aluminum alloy. The dislocation density of alloy is affected by changing the rolling deformation,and post-heat treatment improves fine grains segregation and break coarse second phases.

How does aging affect the microstructure and properties of aluminum alloys?
The research on Al-Zn-Mg-Cu alloys mainly focuses on the effects of solution aging and strain rate on the microstructure and properties of the alloy, as well as the flow stress behavior of the alloy. There are few studies on the effects of hot rolling deformation and reduction pass on the microstructure and properties of aluminum alloy.

What is the dynamic tensile deformation behavior of highstrength aluminum alloys?
The dynamic tensile deformation behavior of two thermomechanically processed high-strength aluminum alloys, AA6082 and AA7075, at strain rates of 40, 200, and 400 s -1 was analyzed in this study. Forming of structures followed a novel processing route allowing for tailoring of microstructure using tempered tools.

Is 7xxx aluminum alloy a hot deformation?
Although some scholars have carried out relevant studies on the hot deformation behavior of 7xxx aluminum alloy, the composition differences of alloying elements such as Zn and Mg have a significant impact on the microstructure and properties of aluminum alloy.

The hot compression simulation testing machine was utilized to conduct compression experiments on an Al-Mg-Si-Mn alloy containing the rare earth element Sc at a deformation temperature ranging from 450 to 550 °C and a strain rate of 0.01 to 10 s-1. The study focused on the hot deformation behavior of the aluminum alloy, resulting in the ...

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The hot deformation behaviors of the new 6063 aluminum alloy modified by rare earth Y and Al-Ti-B master alloy were studied through isothermal hot compression experiments on the Gleeble-3800 thermal simulator. By characterizing the flow curves, constitutive models, hot processing maps, and microstructures, we can see from the true stress-true strain curves that ...

Figure 12 is the polarization curve of 2024 aluminum alloy with different deformation in 3.5 % NaCl solution. According to the Tafel extrapolation method, ... When the deformation is 5-15%, the deformation energy storage of 2024 aluminum alloy is limited, and the pre-recovery is dominant. There are only a few subgrains after annealing, and ...

The effects of hot rolling deformation and deformation pass on microstructure and properties of aluminum alloy were also studied. The results show that dynamic recrystallization ...

Stress-strain curves of the EN AW 6082 aluminium alloy with 1.2 Si-0.51 Mg-0.75 Mn (wt.%) were determined by the uniaxial compression tests at temperatures of 450-550 °C with a strain rate of 0.5-10 s-1. The initial structure state corresponded to three processing types: as-cast structure non-homogenized or homogenized at 500 °C, and the structure after homogenization and hot ...

the problem ofthe central insufficient deformation to gain the aluminum alloy plate with high performance. Compared to synchronous rolling, asynchronous rolling can improve central deformation. However, the warpage of ... proves the deformation of the plate energy storage and degree of the recrystallization artificially [13]. The research by ...

The microstructure evolution of 7A85 aluminum alloy at the conditions of strain rate (0.001 - 1 s-1) and deformation temperature (250-450 °C) was studied by optical microscopy (OM) and electron back scattering diffraction (EBSD). Based on the K-M dislocation density model, a two-stage K-M dislocation density model of 7A85 aluminum alloy was ...

This study obtained true stress-strain curves for three different reduction ratios of deformation. Five strain rates of 0.001 s-1, 0.01 s -1, 0.1 s -1, 1.0 s -1, and 5s -1 were used to construct a constitutive model of 7055 aluminum alloy under the reduction ratio of 60 %.

Recrystallization refers to groups of processes which can manifest stress relaxation to varied extents in a deformed metal by releasing the stored energy generated from the deformation process when heat-treated at an appropriate temperature [2], [7].Understanding of the mechanisms of recrystallization evolved over time from its first mention in scientific ...

For cryogenic applications, aluminium alloys have received a signicant interest as a potential candidate owing to their good strength-to-weight ratio. In the recent decades, an extensive number of studies have reported that

aluminium alloys exhibit enhanced tensile properties at cryogenic tem-peratures [4 -13].

The effect of initial deformation stored energy, target temperatures and heating rates on the microstructure and texture as well as the hardness and conductivity of 7085 aluminum alloy were ... Expand

The hot deformation behavior of spray-formed 7055 aluminum alloy was investigated using a thermo-mechanical simulator by a series of isothermal and constant strain-rate compression tests. These tests were at deformation temperatures ranging from 653 to 713 K and strain rates ranging from 0.1 to 15s-1. The microstructure characteristics of these ...

The new all-aluminum alloy conductors gradually replace the steel core conductors and develop rapidly and are widely used around the world in aerospace, co ... the heat treatments, the grains will merge, grow, and form new grains. Therefore, the grain size mainly depends on the deformation energy storage and temperature of heat treatments. Zhao ...

In this research, the commercial pure aluminium sheets with 98% deformation have been obtained by using traditional rolling technique to storage enough deformation energy. After the above severe plastic deformed pure aluminium is annealed at 350 °Cto 520 °C with 1000 °C/s ultra-fast heating rate, the accumulated deformation energy can be ...

Aluminium alloy 6061-T6 (AA6061-T6) shows a promising potential for cryogenic structural applications. This alloy exhibits remarkable monotonic tensile properties at low temperatures. However, there is a limited number of studies on the cryogenic deformation behaviour. In this study, both monotonic and cyclic loading were conducted, and various microstructure ...

The hot deformation behaviors of the new 6063 aluminum alloy modified by rare earth Y and Al-Ti-B master alloy were studied through isothermal hot compression experiments on the Gleeble-3800 ...

The Al-Zn-Mg-Cu series aluminum alloy is known as an ultra-high-strength alloy which are widely used in aviation and aerospace fields due to its ultra-high-strength properties, which are characterized by high strength, low density, and excellent plasticity [1,2,3] contrast to typical alloys like 7075 or 7050, the Al-7.92 Zn-1.64 Mg-2.00 Cu alloy, featuring high Zn ...

The storage energy was sufficient to overcome the interaction force of the grains [11]. ... It was found out that continuous dynamic recrystallization for 2195 aluminum alloy during deformation at high temperatures is based on three types of subgrains forming mechanisms: dislocation tangling to form subgrains, microscopic shear bands with ...

Former research on deformation of aluminum alloy mainly focused on deformation mode (e.g., conventional deformation (rolling ... dislocations) accumulate to form deformation storage ...

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The deformation behavior and microstructure of 6061 aluminum alloy processed by severe plastic deformation (SPD) using biaxial alternate forging that can evaluate the forming limit and mechanical properties of alloys, simultaneously, were investigated in this study. A finite element (FE) analysis on the biaxial alternating forging process, considering the ...

Nickel aluminum bronze alloys with ultimate strength of 1148.3MPa, yield strength of 843.2MPa and elongation of 15.2% were prepared. ... The analysis shows that the formation of these high-density ultrafine twins is mainly attributed to the large amount of deformation energy storage, high-density defects, and ultrafine precipitates of the ...

3.1 Flow Stress Behavior. Figure 3 shows the flow curves of 7085 Al alloy under single-pass compression with various deformation conditions. Figure 3 indicates that the flow stress of 7085 Al alloy during hot deformation is related to the deformation temperature and strain rate. In general, the competition between work hardening and dynamic softening changed the ...

In order to accurately describe the ultrasonic energy attenuation characteristics in plastic deformation, the hardening equation of 2219-O aluminum alloy considering ultrasonic propagation distance and plastic strain was built, and the model accuracy was verified based on the experimental data.

The development of the novel transition metal (TM)-aluminide alloys, including the TiAl, FeAl, CoAl and NiAl, has been the subject of intense studies due to their attractive mechanical ...

Hot compression tests were conducted to explore the deformation behavior of an extruded 7075 aluminum alloy bar at elevated temperatures. Specimens with 0°, 45°, and 90° angles along the extrusion direction were prepared. The compression temperatures were 300 and 400 °C, and the strain rates ranged from 0.001 to 0.1 s-1. The corresponding microstructures ...

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In this study, the hot deformation activation energy values of 7050-T7451 aluminum alloy, calculated with two different methods under three deformation modes, were compared. The results showed that the hot deformation activation energy values obtained with the classical constitutive equation are nearly equivalent under the hot tensile, compression, and ...

The dynamic tensile deformation behavior of two thermomechanically processed high-strength aluminum alloys, AA6082 and AA7075, at strain rates of 40, 200, and 400 s -1 ...

Fe40Mn20Cr20Ni20 medium-entropy alloy (MEA) has a single-phase crystal structure with high strength and

good ductility at room temperature. It is important to study the hot deformation behavior for this alloy at a partially recrystallized state for possible high-temperature applications. In this investigation, the tensile tests were conducted on sheet materials treated ...

The relevant performance can be determined with the help of different techniques. 35-37 Numerous studies already focused on the high strain rate (HSR) deformation behavior of aluminum alloys at room temperature. 38-48 Yan et al. explored the strain rate sensitivity (SRS) of AA5059 aluminum alloy in a wide range of strain rates from 0.001 to ...

The main objective of this paper is to review the microstructural evolution during hot deformation in Al alloys and its role in determining the viscoplastic behaviour and post-forming properties, ...

The reduction of deformation storage energy in solid solution treatment is difficult to make some dislocations annihilate [29]. Download: Download high-res image (1MB) ... The equivalent strain of 7075 aluminum alloy under simulated deformation is shown in Fig. 14. The equivalent strain increases with the increase of the deformation.

The plastic deformation ability of aluminum alloys is poor and cracking can easily occur during traditional stamping. Electromagnetic forming is a high-speed forming method that can increase the forming limits of aluminum alloys. ... The maximum energy storage of the electromotive force (EMF) coil was 200 kJ and the capacitance C was 640 mF ...