

Investigations And Applications Of Severe Plastic Deformation Nato Science



Investigations and Applications of Severe Plastic Deformation (NATO Science Partnership Sub-Series: 3:)

by Ian Hutchinson

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Severe plastic deformation (SPD) is a metalworking process that involves the application of large plastic strains to a material. This process can be used to produce materials with a variety of unique properties, including high strength, high ductility, and superplasticity.

SPD is a relatively new process, and it is still being investigated by researchers around the world. However, there have already been a number of promising applications for SPD, including:

- The production of high-strength materials for use in aerospace and automotive applications
- The production of high-ductility materials for use in medical devices and implants
- The production of superplastic materials for use in the forming of complex shapes

The Science of Severe Plastic Deformation

SPD is a complex process that involves a number of different mechanisms. These mechanisms include:

- **Dislocation glide:** This is the movement of dislocations through a material. Dislocations are line defects in the crystal structure of a material, and they can move under the application of stress.
- **Grain boundary sliding:** This is the movement of grain boundaries relative to each other. Grain boundaries are the boundaries between grains, which are the individual crystals that make up a material.
- **Twin boundary migration:** This is the movement of twin boundaries relative to each other. Twin boundaries are the boundaries between twins, which are mirror-image copies of each other.

The relative importance of these different mechanisms depends on the material and the specific SPD process being used.

Applications of Severe Plastic Deformation

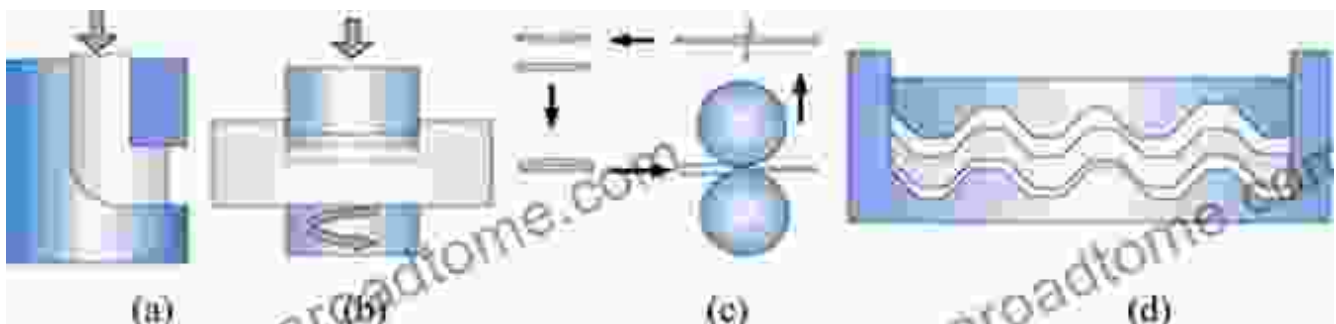
SPD has a wide range of potential applications, including:

- **Aerospace:** SPD can be used to produce high-strength materials for use in aircraft and spacecraft.
- **Automotive:** SPD can be used to produce high-strength materials for use in cars and trucks.
- **Medical:** SPD can be used to produce high-ductility materials for use in medical devices and implants.
- **Electronics:** SPD can be used to produce high-conductivity materials for use in electronic devices.
- **Energy:** SPD can be used to produce high-efficiency materials for use in solar cells and fuel cells.

SPD is a versatile process that can be used to produce a wide range of materials with unique properties. As research continues into this process, new applications for SPD are likely to be discovered.

SPD is a promising new metalworking process that has the potential to revolutionize the way we manufacture materials. By understanding the science of SPD, we can develop new materials with tailored properties for a wide range of applications.

Learn more about SPD





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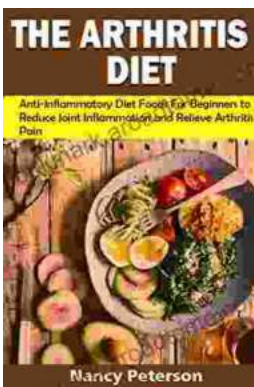
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