THESIS INFORMATION

Thesis title: INVESTIGATION OF THE IMPACT OF SEVERE PLASTIC DEFORMATION ON THE TRANSFORMATION OF MICROSTRUCTURE AND MECHANICAL PROPERTIES OF METALS

Major: Materials forming technology

Major code: 62 52 04 05

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1. Thesis objectives:

   - The dissertation aims to study the application of the mechanical method in manufacturing bulking materials with ultra-fine microstructure and nano materials.

   - Researching on the theory of forming in SPD technique and considering the impact of different technological factors on microstructure, mechanical properties, forming progress and product quality.

   - Designing and fabricating the experimental equipment system for ECAP which is a typical SPD process and has the ability to apply to materials with several sizes.

2. Contributions of the thesis:

   - Definition of some theoretical formulas and empirical formulas for calculating material forming parameters.

     Applying the cutting and assembling technique with several types of mold in designing and manufacturing, simulation with the method of finite element,
which provides the state of forming pressure of sample and forces composition in arbitrary areas of the mold.

- Equipment system and mold have a logical structure and satisfy the technological requirements of ECAP technology. Assembly mold which was manufactured for empirical investigation has high reliability for specific technological functions: Structure used for control the contradictory pressure; Structure applied for transforming passive friction to active one which is contributing for the durability of pestle… Assembly mold is able to press the hard and stable materials.

- Clarifying the nature of intense deformation and requirement of producing ultrafine and nano materials in SPD forming process, the possibility of plasticity charting and the application of mathematical models for particle separation, fragmentation and mechanical change within very large deformation and high hydrostatic pressure conditions.

The plasticity in the forming process of ECAP is analysed by a discontinued velocity method and roughly resolving the differential equation method. With these two methods, the formulas for calculating the state of stress parameters, deformation resistance and deformation volume were determined. Combining and comparing with sliding methods, the method of validation shows that formulas are set up based on the correct theory and high accuracy, which enriches the theoretical basis, ensures the reliability for the design of equipment, molds, and fixtures.

Advisors

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