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The Texture Analysis of Ni Single Crystal after SPD

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Extended Abstract

The interest in severe plastic deformation methods is continuously escalates due to the fact that many new developed technologies require the employment of nanoscale materials. Apart from nanostructure the material should define at least fair corrosion resistance and high mechanical properties. There are two ways of receiving nanocrystalline materials – so called "bottom up" and "bottom down". First method is premised on powder metallurgy (initial material is a powder consolidate in next step and finally sintered) and the second one is based on severe plastic deformation (SPD). There are few methods applied to reduce grain size by strong deformation such as extrusion (recently most popular hydrostatic extrusion HE, Cyclic Extrusion Compression (CEC), Equal-Channel Angular Extrusion (ECAE) or Equal-Channel Angular Pressing (ECAP), Accumulative Roll-Bonding (ARB) , High Pressure Torsion (HPT) .

The effect of hydrostatic extrusion (HE) on the microstructure and crystalline orientation of the 〈100〉 nickel single crystals was examined. The crystals were deformed by two-step hydrostatic extrusion to achieve the true strain ε_r=1.2. After the extrusion the samples had the form of cylindrical rods. The mechanical properties of the extruded samples (expressed in terms of their microhardness.. The microstructure of the samples and the orientation evolution were examined using transmission electron microscopy (TEM), texture evolution was investigated by X-Ray diffraction (XRD).

The deformed crystal had an inhomogeneous ultra-fine-grained structure (as observed by TEM). The average grain diameter was 250 nm. The texture investigations have shown the presence of the texture of a fiber.