MM 43: Mechanical properties II

Time: Friday 11:00–12:00 Location: H6

MM 43.1 Fri 11:00 H6

high strength nanoporous platinum prepared by dealloying — •Haijun Jin[1], Dominik Kramer[1], Julia Ivanisenko[1], and Jörg Weissmüller[1,2] — [1]Forschungszentrum Karlsruhe, Institut für Nanotechnologie, Karlsruhe, Germany — [2]Technische Physik, Universität des Saarlandes, Saarbrücken, Germany

Nanoporous metals prepared by dealloying, which have been proposed for technological applications due to its novel properties, are typically brittle even when the metal skeleton consists only of a ductile element like gold. Here, we report on the fabrication of a material which combines nanoporosity and large surface area with improved mechanical properties. A dual-phase Pt-Ag alloy, of which one phase is the silver-rich matrix and another the platinum-rich dendrites, was subjected to dealloying. The silver-rich matrix was dealloyed to form a nanoporous Pt structure. And the platinum-rich dendrites were stable and remained undissolved after dealloying, which are expected to act stabilizing against shear localization and critical crack propagation in nanoporous metals. Compared with Pt samples with uniform nanoporous structure, this composite-like material exhibits a high strength over 200 MPa and large plastic deformation prior to failure under compression.

MM 43.2 Fri 11:15 H6

Novel high-strength Fe-based composite materials with large plasticity — •Katarzna Werniewicz[1,2], Uta Kühn[1], Norbert Mattern[1], Jürgen Eckert[1], Uwe Siegel[1], Birgit Bartusch[1], Ludwig Schultz[1], and Tadeusz Kulik[2] — [1]IFW Dresden, P.O. Box 270116, D-01171 Dresden, Germany — [2]Warsaw University of Technology, Faculty of Materials Science and Engineering, ul. Woloska 141, 02-507 Warsaw, Poland

Among glass-forming alloy systems reported so far, Fe-based bulk metallic glasses play a special role. Compared to other amorphous alloys e.g. Zr-, Ti-based, such glasses show superior mechanical strength. However, due to the general brittleness their wider application as structural materials is strongly restricted. The alternative approach to overcome this defect is to design BMG composites. In this work we present a series of new Fe-Cr-Mo-Ga-(Si,C) composite materials derived from an Fe-Cr-Mo-Ga-C-P-B glassy alloy, with the aim to improve the ductility of this high-strength material. The effect of the composition and the phase formation on the resulting mechanical properties was investigated. It has been found that the formation of a complex microstructure, which essentially consists of soft Ga-rich dendrites embedded in a hard Cr- and Mo-rich matrix, leads to a material with excellent compressive mechanical properties. While the obtained values of true strength are comparable with data reported for Fe-Cr-Mo-Ga-C-P-B BMG, the values of true strain are greatly improved for investigated composites.

MM 43.3 Fri 11:30 H6

Texture and mechanical anisotropy of ultrafine-grained Al alloy AA6016 produced by accumulative roll bonding — •Werner Skrotzki[1], Ingwar Hünsche[1], Juliane Hüttenrauch[1], Heinz-Günter Brokmeier[2], Heinz Werner Höppel[3], and Irena Topic[3] — [1]Institut für Strukturphysik, Technische Universität Dresden — [2]GKSS Forschungszentrum, Geesthacht — [3]Lehrstuhl Allgemeine Werkstoffwissenschaften, Universität Erlangen-Nürnberg

The texture of ultrafine-grained Al alloy AA6016 produced by accumulative roll bonding (ARB) has been measured by neutron diffraction. The starting texture consists of a strong cube component. During ARB this texture breaks down and a texture typical for rolling of face-centred cubic metals with high stacking fault energy develops. The texture after 8 ARB cycles is characterized by the beta-fibre with the Cu component dominating. Moreover, the rotated cube component forms. This component is typical for simple shear which during rolling takes place in the surface layer of the sheets. Based on the Lankford parameter calculated the mechanical anisotropy of the advanced metal sheets will be discussed.

MM 43.4 Fri 11:45 H6

Cu-Ag-alloys: materials with combined optimum properties — •Julia Lyubimova[1], Jens Freudenberger[2], Alexandre Gaganov[3], and Ludwig Schultz[4] — [1]IFW Dresden, Helmholtzstraße 20, 01069 Dresden, Germany — [2]IFW Dresden, Helmholtzstraße 20, 01069 Dresden, Germany — [3]IFW Dresden, Helmholtzstraße 20, 01069 Dresden, Germany — [4]IFW Dresden, Helmholtzstraße 20, 01069 Dresden, Germany

In the present work two alloys, namely Cu - 7wt.% Ag and Cu - 24wt.% Ag, were investigated. The combination of optimum mechanical and electrical properties of these alloys was achieved. The conductor shows a ultimate tensile strength of 1,2 GPa, a strain to failure of 1,6 % and an electrical conductivity of 60 % IACS. The mechanical properties can be improved e.g. by the deformation at low temperatures or by the addition of a third element. The effect of the deformation temperature and also the Zr - addition on the properties of these alloys will be discussed. In addition, the fatigue behaviour of cold worked Cu - Ag - alloys will be shown.