

Applying Severe Plastic Deformation Technique To Fulfil Solid Mixing Of Different Bulk Metals And To Synthesis Metal-Metal Nanocomposites

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Abstract

High-pressure torsion (HPT) is one of novel severe plastic deformation techniques that can achieve significant grain refinement and strength enhancement in various metals and alloys. In recent years, it was found HPT processing can effectively mix two different metals / alloys from the solid state to produce novel bimetallic composites with excellent mechanical properties ^[1,2]. We have successfully processed a Cu-Ta composite using prepacked Cu-Ta-Cu disks in a sandwich-like configuration ^[3]. After 150 turns HPT processing, the microstructure showed a two-phase feature containing Cu-rich domains and Ta-rich domains. However, each domain consisted of alternating Cu-rich layers and Ta-rich layers. Vorticity and non-monotonic metal flow due to shear deformation introduced by the HPT contributed to the microstructure refinement and layered microstructure formation. With this novel materials processing technique, it is possible to produce immiscible alloys and design high performance bimetallic composites.

Keywords: *Bimetallic composite, high-pressure torsion, nanostructured materials*

References

- [1] P. Bazarnik, A. Bartkowska, B. Romelczyk-Baishya, B. Adamczyk-Cieślak, J. Dai, Y. Huang, M. Lewandowska and T. G. Langdon, *Journal of Alloys and Compounds*, **846**, 156380 (2020).
- [2] D. Luo, T. Huminiuc, Y. Huang, T. Polcar and T.G. Langdon, *Materials Science and Engineering A*, **790**, 139693 (2020).
- [3] T. Mousavi, J. Dai, P. Bazarnik, P.H.R. Pereira, Y. Huang, M. Lewandowska and T.G. Langdon, *Journal of Alloys and Compounds*, **832**, 155007 (2020).

Biography

Dr. Yi Huang is an Associate Professor at Bournemouth University (UK). She received PhD in Metallurgy and Materials from the University of Birmingham. Before joining Bournemouth University, she worked as a research fellow and senior research fellow at the University of Southern California, University of Cambridge, University of Strathclyde and University of Southampton, she also had a span of industrial working experience as a Materials Engineer in an automotive company, JVM Castings Ltd. Yi's research aims to understand the correlation between the microstructures and mechanical properties of advanced materials and to optimize process parameters for high-value manufacturing. Yi works on the fabrication of ultrafine-grained materials, deformation mechanism and microstructures control.