CONFERENCIA

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Centro Nacional de Investigaciones Metalúrgicas

2.2 GPa ultra-strong nanostructured steel with unexpected large ductility

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Dr. Huang received his BEng and MPhil in Mechanics from Shanghai Jiao Tong University (SJTU) in 2002 and 2004, respectively, and his PhD in Materials Science in 2008 from Delft University of Technology (TU Delft), The Netherlands. From 2008 to 2010, he worked as a research engineer at ArcelorMittal (the largest steel company in the world) in Maizieres-les-Metz, France. His research work in ArcelorMittal focused on the development of new advanced steels for automotive applications. Dr. Huang joined University of Hong Kong in 2010 as an Assistant Professor. Dr. Huang's research interests focus on two areas:

(1) fundamentals of microstructure-property relationship and phase transformation of advanced steels, and (2) development of lightweight materials for automotive applications. Both experimental and modelling works are involved in his research. Dr. Huang is an editorial board member of Materials Science and Technology and the Key Reader for Metallurgical and Materials Transactions A. Dr. Huang has given numerous invited talks at international conference such as PTM 2015, THERMEC and MRS. Dr. Huang has published 50+ SCI papers in international journals such as Acta Materialia, Scripta Materialia, Journal of Mechanics and Physics of Solids and International Journal of Plasticity.

Abstract

For centuries, the quest for achieving high performance bulk metals and alloys for structural applications has been perplexed by the notorious trade-off between strength and ductility. Here we report a conceptually novel strategy to resolve this dilemma by incorporating all available strengthening and plasticity mechanisms at multiple length scales. This approach is a paradigm shift in structural alloy design and offers a steel with a yield strength of 2.2 GPa and an unexpected tensile uniform elongation of 16%. To our best knowledge, this steel stands the best bulk metallic alloys so far in terms of yield strength-uniform elongation combination. More importantly, this steel was produced using conventional thermal mechanical processing routes (i.e. rolling and annealing), which will facilitate its future industrial mass production and applications in a wide spectrum of industrial settings.

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