

Title Grain boundary design of bulk nanomaterials for advanced properties

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Place I²CNER Hall, Ito campus, Kyushu University

Abstract

The concept of grain boundary (GB) design is developed for enhancement of properties of ultrafine-grained (UFG) nanostructured metals and alloys by tailoring different GBs (low angle and high angle ones, special and random, equilibrium and non-equilibrium, and so on), using severe plastic deformation (SPD). By variations of regimes and routes of SPD processing we show for several light alloys (Al, Mg and Ti) and steels the ability to produce UFG materials with different grain boundaries, and the dramatic effect it can have on mechanical and functional properties of the processed materials, in particular, on their strength and ductility, fatigue or superplasticity, thermostability and electric conductivity. We demonstrate several examples of this approach for attaining superior properties in various nanostructured metals and alloys. The origin of these phenomena is discussed on the basis of the results of microstructural studies and observations of deformation mechanisms. Special emphasis is laid on the innovation potential and first applications of SPD-produced nanometals.

About the Speaker

Prof. R. Valiev's Ph.D. thesis was dealing with mechanisms of superplasticity in HCP-metals. Thereafter, his research was focused on the establishment of relation between grain boundaries and properties of metals. In the beginning of 1990's Prof. Valiev with co-workers have made pioneer works on processing ultrafine-grained metals and alloys by severe plastic deformation (SPD). These works have attracted high interest and intensive developing in many countries. His main present research interests comprise studies of unique mechanical and functional properties of SPD produced nanomaterials. Has been Guest Professor at well-recognized research departments in USA, Japan, Europe and China, and received a number of prestigious awards and honors, including the AvH Foundation Research Award and Blaise Pascal Medal in Materials Science.

Host: Professor Zenji Horita

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