京都大学　構造材料元素戦略研究拠点

ESISM セミナー

中国・瀋陽の中国科学アカデミー・金属材料研究所から、Ke Lu（盧柯）博士をお招きして下記のセミナーを開催します。多数お集まりください。

March 26 (Thu), 2015（2015 年 3 月 26 日（木））

14:00-15:30

京都大学吉田キャンパス　工学部物理系校舎 **5F 527** セミナー室

Anisotropic nanostructures in metals -- Breaking property trade-offs

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Investigations over the past few decades indicated that with a substantial reduction of grain sizes into the nanometer regime, strength of polycrystalline metals is greatly elevated at the expense of their ductility and thermal stability. 3-dimensional homogeneous nano-grained (NG) or ultrafine-grained (UFG) metals usually exhibit a very high strength and a very limited tensile ductility (with a uniform elongation of few percent) with almost no work-hardening before catastrophic failure. Grain coarsening temperatures are much reduced with grain refinement: coarsening may occur even at room temperature for nano-grained pure metals. In contrast to the NG or UFG structures with random orientations, 2D nano-laminated structures with low-energy boundaries are found to exhibit superior mechanical properties and thermal stability. Two types of anisotropic nanostructures have been discovered in metals so far: (i) nano-laminated structures with twin boundaries, i.e., nano-twinned structure, and (ii) nano-laminated structures with low-angle boundaries. Measurements showed that these nano-laminated structures are ultra-hard due to their extremely small characteristic sizes (as small as several nanometers), and at the same time very stable owing to their low-energy states. In the present talk, formation processes of the 2D nano-laminated structures in metals during plastic deformation will be dealt with analysis of the effects of processing parameters such as strain, strain rate, and strain gradient. Mechanical properties and thermal stability of the 2D nano-laminated structures in various samples will be studied, with comparisons with those of the 3D NG or UFG materials. The lamellar thickness effects on these properties will be addressed in the nanometer regime. Perspectives of development of the nano-laminated structured materials will be given as well.

RESUME (Dr. K. Lu)

Prof. K. Lu received his PhD in 1990 from Institute of metal Research, Chinese Academy of Sciences. He was a visiting professor in Max-Planck-Institut für Metallforschung (Stuttgart, Germany) and in University of Wisconsin-Madison (USA). He is currently a professor and the founding director of Shenyang National Laboratory for Materials Science (SYNL). He is also a PI of Herbert Gleiter Institute for Nanoscience, Nanjing University of Science & Technology (Nanjing, China).

His research interests are nanostructures in metals and alloys including nano-grained, nano-twinned, nano-laminated, nano-granular, and gradient nano-grained structures. Research activities cover synthesis and processing, nanostructure characterization, thermal stability and phase transformation, mechanical and physical properties of nanostructured materials. He authored and co-authored more than 360 international peer-reviewed journal publications, held 28 patents, and presented over 80 invited lectures at international conferences and symposia. His publications received over 16000 citations with an *H*-factor of 63 so far.

He is a member of the Chinese Academy of Sciences and a member of German National Academy of Sciences Leopoldina. He is an editor of *Progress in Materials Science* (Elsevier) and a reviewing editor of *Science* (AAAS). He received many awards and honors including Humboldt Research Award (Alexander von Humboldt Foundation, Germany, 2011), Kelly Lecturer (University of Cambridge, UK, 2010), Fellow of MRS (USA, 2010), *THERMEC* Distinguished Award (Canada, 2006). Etc.