Ultrafine Grained Materials II

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PREFACE

Two complementary approaches have been developed to synthesize ultrafine-grained (UFG) materials with grain sizes in the range from 10 to 1000 nm. The first is the "bottom-up" approach in which bulk ultrafine-grained materials are assembled from individual atoms or nanoscale building blocks such as nano-particles. Gleiter's pioneering work on inert gas condensation (IGC) is a typical example of this approach. Various chemical and physical methods have been developed to synthesize nano-powders for small-scale laboratory investigations as well as for large-scale commercial use. Ceramic and metallic nano-powders can now be readily purchased from an increasing number of nano-technology companies. However, consolidation of these nano-particles into bulk nanostructured materials remains a major challenge.

The second approach for producing UFG materials is the "top-down" approach in which coarse-grained materials are refined into UFG materials. The most successful "top-down" approach has been *via* severe plastic deformation (SPD) techniques among which the most developed are equal channel angular pressing (ECAP) and high-pressure torsion (HPT). Recently, new SPD techniques have been developed such as accumulative roll-bonding (ARB), multipass-coin-forging (MCF), multi-axis deformation, and repetitive corrugation and straightening (RCS). The main advantage of SPD techniques is their capability for producing bulk UFG materials not only free of porosity but also in dimensions suitable for structural applications.

In the last decade, the processing of UFG materials *via* SPD techniques has received considerable attention from the materials science community. Many research groups have started to work in this exciting field and the annual number of publications has increased exponentially. The Second International Symposium on Ultrafine Grained Materials provides a forum to examine all aspects of the science and technology of UFG materials produced by SPD techniques. This proceedings book includes papers dealing with recent progress in processing and microstructures, microstructural evolution, mechanical and physical properties, superplasticity, computational and analytical modeling, new SPD technologies, *etc.*

The editors are grateful to all of the authors and presenters for making this symposium and this proceedings book a great success. Their responses to this symposium far surpassed the organizers' expectations. The symposium incorporates ninety-three presenters from 15 countries so that this symposium is truly an international forum on UFG materials. Almost all of the papers presented at the symposium are included in these proceedings.

As suggested by the title of this symposium, ultrafine-grained materials will be a continuing theme in future TMS meetings. Future symposia will be held at regular TMS Spring meetings at approximately two-year intervals.

Finally, the editors thank the TMS staff, especially Mr. Stephen J. Kendall, for their considerable guidance and assistance during the preparations for this symposium and in the publication of this important proceedings book.

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