Special Issue on Materials Science on Mille-Feuille Structure

PREFACE

A novel high strength magnesium (Mg) alloy, which includes a unique microstructure, called the Long-Period Stacking Ordered (LPSO) Structure, is developed at the beginning of this century. Current studies have revealed that this high strength property is closely related to deformation kink bands which are induced by thermo-mechanical processes, such as extrusion and rolling. This new strengthening phenomenon has been focused and recognized as one of hot topics in material science. For instance, the number of papers published in international journal dramatically increases, and some of them are ranked in the top 1% high impact paper, e.g., 3). This unique LPSO structure can be generally viewed as “Mille-feuille structure”, in the sense, that they are constructed by alternate stacking of microscopic hard- and soft-layer. It is strongly believed that establishing a universal kink principle applicable to any Mille-feuille structures lead to a new academic- and innovative-area. In addition, based on the understanding “kink strengthening principle” via many methods, it will be able to design new metallic materials including iron, titanium and aluminum alloys as well as further new polymer materials. This provides an exciting opportunity for the development of next generation structural materials.

This special issue involves many new finding results, i.e., experimental and theoretical approaches for the kink formation mechanism, contribution of kink bands to strengthening, microstructural feature of kink bands, new findings on Mille-feuille structures and phases, and many more, which are obtained from new/unique theoretical, experimental and numerical studies. We sincerely hope that this special issue provides an opportunity to understand this unique microstructural formation and its role on strengthening, as well as opens the door to discuss for many researchers and engineers in the other fields.


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