FRONTIERS IN THIN FILM EPITAXY AND NANOSTRUCTURED MATERIALS

This special issue of the Journal of Materials Research contains articles that were accepted in response to an invitation for manuscripts.

Introduction

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Throughout human history, major changes in civilization and quality of life have occurred as a result of discoveries of new materials. From Stone Age to Iron, to Bronze, to Semiconductors, materials have revolutionized and defined our civilization. Just as semiconductors ushered in the era of electronics and information, nanomaterials stand to revolutionize the modern era, as we must do more with less to conserve and sustain our dwindling resources of critical materials.

For every technology there is a "materials bottleneck," and this aspect is amplified considerably for nanotechnology since a large fraction of atoms exist at the interface. Critical issues in nanostructured materials relate to control of defects and interfaces and thermal stability. For nanolayered structures, nanodots, nanotubes, and nanorods, the issues related to orientation control are paramount and must be engineered to realize the advantages of nanostructured materials and nanosystems.

This *JMR* Focus Issue on Frontiers in Thin Film Epitaxy and Nanostructured Materials looks at nanolayered thin film heterostructures, self-assembled nanostructures, and bulk nanostructured materials [1-2]. The role of defects and interfaces to control the properties and address thermal stability issues is considered. In thin films, recurring themes include nanostructuring of materials to improve performance; thin film epitaxy across the misfit scale for orientation control; control of defects, interfaces and strains; and integration of nanoscale devices with conventional microelectronic and nanoelectronic devices. This Focus Issue comprehensively addresses synthesis and processing, nanoscale and atomic-scale characterization, structure-property correlations, modeling and devices of nanostructured materials. The nanomaterials covered in his issue are arranged from thin films (nanolayered) to nanodots, nanorods and bulk nanostructured materials.

REFERENCES

1. J. Narayan: Recent progress in thin film epitaxy across the misfit scale. *Acta Mater.* **61**, 2703 (2013).
2. A. Goyal, J. Narayan, Q. Lin: Self-Assembly and directed assembly of advanced materials. *J. Mater. Res.* **26**, 109 (2011).

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