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Degradation Processes in Nanostructured Materials

Editors: Mircea Chipara, Orazio Puglisi, Ralph Skomski, Frank R. Jones and Benjamin S. Hsiao
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Degradation Processes in Nanostructured Materials

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PREFACE

The unifying theme of Symposium Q, "Degradation Processes in Nanostructured Materials," held November 28–December 1 at the 2005 MRS Fall Meeting in Boston, Massachusetts, was natural aging and artificial degradation in a broad variety of nanostructured materials. The considered structures—including nanotubes, nanofibers, thin films, nanoparticles and composites—were made from various types of substances, such as elements (C, Si, Sn), oxides, metals, and polymers. In addition, some papers dealt with specific structural features, such as surfaces, interfaces, and grain boundaries. The nanoscale character of the materials, as compared to the micron-size structuring of many traditional materials, leads to quantitative changes and to new physical phenomena. The reason is that the involved structural length scales are comparable to physical length scales such as gyration radii in polymers and domain-wall widths in magnetic materials.

The interdisciplinary character of the symposium was manifested by the breadth of the phenomena and applications which were considered; from electronic, optical, structural, and magnetic nanomaterials to space, chemical, biological and medical applications. A key theme in many invited and contributed talks, was the interplay between structural degradation and the time dependence of material properties and merit indices. Aside from natural aging, there was emphasis on the time dependence associated with artificial treatments involving electrical currents, annealing, and irradiation by various sources, such as gamma radiation and ions.

Some papers focused on nanoscale thermal degradation, corrosion, flammability, embrittling, and fatigue. Among the irradiation effects, which are important not only in space applications, were changes in mechanical and functional properties arising from gamma and ion irradiation.

Finally, we are pleased to share the success of this symposium with the authors and participants and to acknowledge the continuous help, support, and understanding of the Materials Research Society staff.

Mircea Chipara
Orazio Puglisi
Ralph Skomski
Frank R. Jones
Benjamin S. Hsiao

February 2006

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