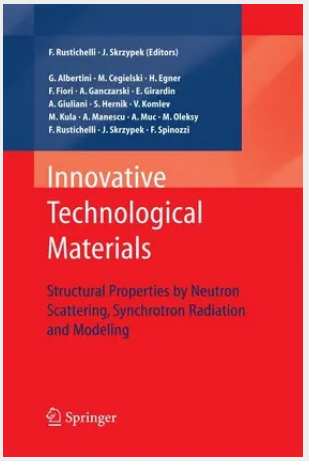
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Innovative Technological Materials

Structural Properties by Neutron Scattering, Synchrotron Radiation and Modeling

arranged. Among them the following types are met: nanotubes, nanop- ticles, nanopowders, nano?bers, nanowires, nanocomposites, etc. • At the microscale – Microcomposites, such as metal matrix composites (MMCs), ceramic matrix composites (CMCs), alloys or superalloys, s- tered powders, ceramic materials, magnetorheological ? uids (MRFs), etc. • At the macroscale – Macrocomposites, such as functionally graded ma- rials (FGMs), thin layers or ?lms, thermal or oxidation or wear resistant coatings, multilayered structures, long ?ber composites, etc. At each level of analysis a response of the material to any physical excitation may be observed, measured and analyzed. In the sense of innovation of a material, the changes or new ideas can be introduced on the same scale of control (say, atomic or nano) in order to achieve fundamentally new behavior on the other scale of observation (say, micro or macro). For instance, by replacing some similar atoms in the metal crystal str- ture (e. g. Ti–Ti or Al–Al), by unlike atoms in the crystal (e. g. Ti–Al), wi- out the lattice symmetry of the original material changing, new improved properties and characteristics may be observed in intermetallics at the - cro or macroscale (higher speci?c strength, better creep resistance at elevated temperatures, better corrosion resistance, to mention only some properties observed at the macroscale). Similarly, changing material characteristics at the nanoscale, enables creation of completely new material functionality at micro or macroscales (e. g.

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