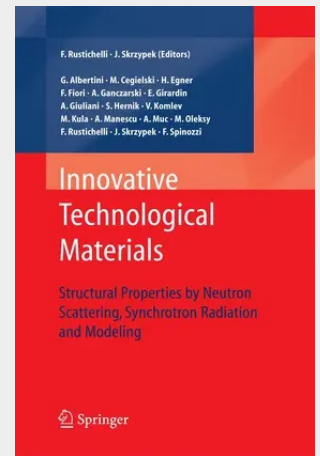


Innovative Technological Materials

Structural Properties by Neutron Scattering, Synchrotron Radiation and Modeling

arranged. Among them the following types are met: nanotubes, nanoparticles, nanopowders, nanofibers, nanowires, nanocomposites, etc. • At the microscale – Microcomposites, such as metal matrix composites (MMCs), ceramic matrix composites (CMCs), alloys or superalloys, sintered powders, ceramic materials, magnetorheological fluids (MRFs), etc. • At the macroscale – Macrocomposites, such as functionally graded materials (FGMs), thin layers or films, thermal or oxidation or wear resistant coatings, multilayered structures, long fiber 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 structure (e. g. Ti–Ti or Al–Al), by unlike atoms in the crystal (e. g. Ti–Al), without the lattice symmetry of the original material changing, new improved properties and characteristics may be observed in intermetallics at the micro or macroscale (higher specific 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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