

PC 58

SELF-ASSEMBLED NANOSTRUCTURES IN COPOLYMER BLENDS: SAXS, SANS AND TEM STUDY

J. Holoubek, J. Baldrian, F. Lednický

*Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic,
Heyrovsky Sq. 2, Prague, Czech Republic (holou@imc.cas.cz)*

Nanostructured polymers, a substantial part of nanostructured materials and surfaces, provide attractive avenues for the development of nanotechnologies, optically active materials, biomaterials, membranes, battery components, electronics and photonics

Phenomena associated with the phase behaviour and self-assembled nanostructures of three block copolymer systems have been studied by small-angle X-ray scattering (SAXS), small-angle neutron scattering (SANS) and transmission electron microscopy (TEM).

1) System A-*b*-B/A (*d*PS-*b*-PMMA/PS homopolymer) were studied as a function of molecular weight and concentration of the added polymer. A criterion for “wet and dry brush” behaviour respecting different solubilization of the homopolymer in microdomain morphology has been applied to explain the changes in microdomain morphology.

2) System (A-*b*-B)₁ / (A-*b*-B)₂ (where A is perdeuterated polystyrene (*d*PS) and B is deuterated or hydrogenated poly(methyl methacrylate) (*d*PMMA or PMMA). Binary blends of the diblock copolymers having different molecular weights and different original micromorphology were prepared. One copolymer is in a disordered phase and the other is in lamellar phase at temperatures used in the study. The criterion for forming a single domain morphology (molecularly mixed blend) taking into account different solubilization of copolymer blocks has been applied to explain the changes in microdomain morphology during the self-assembling process.

3) System A-*b*-B / A-*b*-C i.e. with one block in common (*d*PS-*b*-PMMA / *d*PS-*b*-PI). One copolymer is in disordered microdomain state, while the other displays lamellar morphology at ordinary temperatures. Self-assembled structures in blends were investigated as a function of concentration of the added microphase-separated copolymer and temperature.