

Editorial corner – a personal view

Emerging nanostructured polymeric materials

*J. Seppälä**

Department of Chemical Technology, Helsinki University of Technology, P.O. Box 6100, FI-02015 TKK, Finland

In polymer science and technology just the control of molecular weight and composition is not enough. In addition, and simultaneously, molecular weight distributions, compositional distributions, stereo structures and interactions between molecules need to be understood and controlled. The overall control of these various parameters offers tremendous possibilities in materials science and engineering. Nature is master in synthesizing specific polymers and tailoring their properties. Weak interactions between polymeric molecules and organised structures can produce complicated functionalities in natural polymers. In the field of synthetic polymers we still have huge potential ahead to study and make usable.

The control of materials structures in different hierarchical levels is of prime importance in nanomaterials. The length of a covalent bond is around 0.1nm which means that polymerization catalysts can be considered as ‘nanoplants’ with a diameter of around one nanometre, thicknesses of polymer crystalline lamellas are typically some tens of nanometres, lengths of polymeric molecules are in the range of tens or hundreds of nanometres or more.

The concept of nanotechnology in polymers can comprise the production of controlled nanostructures on the materials surface, of large specific surface areas through production of nanofibers and nanosize porous structures, of in nano level organised supramolecular structures through self assembling, and of nanocomposites by combining

nanoparticles and nanofibers with polymeric matrices.

In aiming to tailor materials properties on every level, the control of the structures should start already in the synthesis stage. Here the progress in polymerization catalysis and polymer reaction engineering are of key importance. The advance in organometallic chemistry has enabled progress in stereospecific synthesis, today especially in olefin polymerizations. ‘Living’ free radical or atomic transfer polymerizations have offered us novel possibilities to prepare various molecular architectures and block copolymers, like amphiphilic polymers or highly branched functionalised polymers, hyperbranched and dendritic polymers being the extreme results.

To fully exploit the progress in the new polymers, one needs to be able and willing to network and collaborate over the borders of different fields of science. Innovations are created at the interfaces!



Prof. Dr. Jukka Seppälä
Member of International Advisory Board

*Corresponding author, e-mail: jukka.seppala@tkk.fi
© BME-PT and GTE