

142av Functional Polymer-Polymer Nanocomposites

Mohamed Aflal M.R. and Giuseppe R. Palmese

Functional materials, such as hydrogels and ionomers, are finding wide ranging applications such as in chemical valves, drug delivery systems, self healing materials, proton exchange membranes and artificial muscles. A setback with these materials is their weak mechanical properties, and while most of these functional materials are hydrophilic in nature, structurally stable materials are most often hydrophobic. This apparent mismatch in structural properties is intriguing for the fact that it may be possible to bring into intimate contact materials that are thermodynamically dissimilar while retaining their individual properties. An approach to carry this out is the stabilization of these functional moieties with a hydrophobic nanoporous network resulting in the formation of stable, responsive composites. The functionality we envision within such composites would be a variation in diffusivity with applied electric field resulting in tunable permeation selective membranes; or have properties of self healing resulting in active crack-propagation reversal and not just passive reduction. Both these aspects of functional materials depend on the type of ionic filler utilized. The synthesis of nanoscale ionic polymer domains within stable polymer matrices would provide an understanding into the mechanisms of deformation and interactions at length scales approaching nanoscopic dimensions. Thus, the work discussed is a summary of efforts in the synthesis and characterization of incorporated functionality into nanoporous host matrices.