Polymer Thin Films with *In Situ* Grown Metal Nanoparticles

T. P. Radhakrishnan
School of Chemistry, University of Hyderabad, Hyderabad – 500 046, India
Email : tprsc@uohyd.ernet.in, Web : http://202.41.85.161/~tpr/

Metal – polymer nanocomposites are versatile materials which not only combine the unique characteristics of the components, but also manifest mutualistic effects. Some of the most convenient and attractive routes to the fabrication of metal nanoparticle – embedded polymer thin films involve the *in situ* generation of the nanoparticles through reduction or decomposition of appropriate precursors inside the solid film. We will describe a general and environment-friendly protocol that we have optimized for the fabrication of noble metal nanostructures inside polymer thin films, using aqueous medium for the synthesis and deploying the polymer itself as the reducing as well as stabilizing agent.[1,2] The *in situ* growth of metal nanoparticles inside polymer films provides a unique opportunity to monitor the growth process in real time using microscopy; we will describe recent studies carried out in this direction. A variety of techniques that have been exploited by our group and other investigators to characterize the precursor to product transformation inside the polymer film will be discussed briefly.[3] The unique control provided by the *in situ* fabrication route on the size, shape and homogeneous distribution of the nanostructures and chemical transformation within the polymer film will be highlighted. Following a brief overview of the range of applications of the polymer thin films with *in situ* generated metal nanoparticles, reported by us and others in areas such as nonlinear optics, microwave absorption, random lasers and e-beam lithography,[4] some new directions of explorations will be noted.

References

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