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Novel green synthesis of gold and silver nanocolloids, and structured nanofluid and enhanced thermal transport in them

We report synthesis of Au and Ag nanocolliods and structured Au nanofluids that have been synthesized by simple, green and one step methods. Both the methods[#] one using a natural fibre like Jute, and other using an excimer laser give rise to stable colloids with nanoparticles diameters less than few tens of nanometers. In both the methods no reducing agent and stabilizing agentor any hazardous chemicals need be added or used and water is the dispersing medium. The stability of the nanocolloids and structured nanofluids has been tested for over a year using absorbance by the metal plasmonic bands in the dispersing medium as a monitoring tool. In case of the Jute based synthesis of Ag nanocolliods, the surface of the natural fibre jute that has nanosized pores, acts as a reaction "vessel" on which the Ag nanoparticles are produced *in-situ.* It utilizes α–cellulose present in the jute fibre as a reducing agent of Ag salt and no extra chemicals need be added. The resulting Ag nanoparticles have size dispersion within the range 12-15nm. In case of laser based synthesis of Au nanofluids, laser ablation of a gold coin by an excimer laser (248 nm) created Au nanoparticles dispersed directly into the liquid medium. No reducing agent/chemical is needed for making the nanoparticles of average diameter ≈ 8-10 nm. Interestingly, the resulting nanofluid can be made structured (like a connected network of Au nanoparticles that make a Au necklace) using ethylene glycol as the dispersing medium instead of water. The method can also be used for making Ag nanocolliods where an Ag target is used in place of Au target. For application, we tested both the Ag and Au nanocolloids as heat transport medium where they were used as nanofluids. Both the nanofluids show enhanced thermal conduction over that of the dispersing medium. This was tested using a dynamic technique where the frequency dependence of the thermal effusively can be tested and the enhancement of the thermal conduction can be evaluated.

Speaker Biography

Prof. Raychaudhuri obtained his M.Sc from IIT, Kanpur (1975) and Ph.D from Cornell University (1980). He had post-doctoral experience at the Max Planck Institute (FKF), Stuttgart as an Alexander von Humboldt Fellow (1980-1982). He served as the Director and Distinguished Professor of S.N.Bose National Centre for Basic Sciences from March 2006 to September 2014. Prior to joining the Centre in 2004 as a Senior Professor , he worked as a Professor of Physics in Indian Institute Science (IISc), Bangalore from 1982 and as Director, National Physical Laboratory (NPL), New Delhi from 1997-2000.

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