We have developed processes by controlling the microemulsion parameters (solvent, surfactant, cosurfactant and Wo parameters) to obtain uniform and monophasic nanostructures of pure metals, metal carboxylates, metal oxides, chalcogenides and borides. These include nanomaterials having interesting optical, magnetic and dielectric properties. Our studies show that the bulkiness of the solvent molecules leads to larger dimensions of the nanorods. The surface charge on the nanorods also plays an important role in the anisotropic growth of the oxalate nano rods with diameters of 20-100 nm. In the case of copper succinate the rod–like structures are formed by an ordered assembly of spherical particles of 4-5 nm which is facilitated by the hydrated water molecules. We have also obtained various metal and alloy nanoparticles (5-7nm) such as Co-Ni and Cu-Ni. We have also obtained core-shell nanostructures of the type, Ag@TiO₂, CdS@TiO₂ and ZnS@TiO₂ which have been stabilized using this method and investigated their magnetic and optical properties. Metastable forms may be stabilized using microemulsions under ambient conditions as we show in the case of aragonite and vaterite form of CaCO₃ and the fcc structure of Co nanoparticles of 4 nm size. Thus in this discussion the versatility and precision of the microemulsion process will be highlighted.

Short Bio: Prof Ashok K. Ganguli obtained his M.Sc. degree in Chemistry from the University of Delhi (1984) and Ph.D. from the Indian Institute of Science Bangalore, India(1990). He then worked at the Central Research & Development Department of the DuPont Company at Wilmington, Delaware, USA (1990-91) and Ames Laboratory, US-DOE, at Iowa State University with Prof John D Corbett, F. N. A. Sc (USA). He joined the chemistry department of IIT Delhi in November 1995 & became a full professor in 2006. Dr Ganguli has contributed extensively to the field of dielectric, superconducting and magnetic oxides. He has also contributed extensively to the area of polar intermetallics and nanocrystalline materials. Prof. Ganguli has published around 125 papers in International journals and contributed 6 chapters in books. Prof. Ganguli was the recipient of the Materials Research Society of India Medal for 2006 and the Chemical Research Society of India Medal for 2007.