TECHNOLOGY REGISTRY

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4.	Area of Technology (e.g. materials, health care etc.) : Synthesis and characterization of acrylamide based nanosize hydrogels and silica composites through water-in-oil microemulsion polymerization.
5.	Web link, if any : N. A.
6.	Description in 500 words : Since several decades there has been remarkable outgrowth in the widespread usage of polyacrylamide (PAM). The exclusive properties of PAM / Poly N-isopropylacrylamide (PNIPAM) / Poly2-acrylamido-2-methyl-1-propanesulfonicacid (PAMPSA) group provides a stark differentiation and promotes interest to proceed for interesting studies in this family for synthesis and characterization of nanogels, ionic copolymer nanogels, nano size composites. Therefore, AM monomer is exclusively selected for preparation of nanogels. Besides another hydrophilic and acidic-monomer, AMPSA from the same family of AM is also selected for copolymer synthesis. The abovementioned features of AMPSA monomer and the availability and relative cheapness of AM monomer facilitates to combine the advantages of these hydrophilic monomers through microemulsion polymerization process. Further, nanosize composites of AM with filler (silicon dioxide nanopowder) as well as functionalized composites of AM, AMPSA with filler have also been prepared through same

	route. So, on the basis of microemulsion stability, PAM nanogels, poly(AM-co-AMPSA) copolymer nanogels, PAM/SiO_2 nano size composites and poly(AM-co-AMPSA)/SiO_2 composite nanogels have been synthesized by in-situ water-in-oil (W/O) microemulsion process. Besides, the use of a low percentage of AMPSA as a specialty monomer seems to play a major role in achieving successful exploitation of silica in the preparation of polymer-silica nano size composites by in-situ polymerization. The size of the synthesized PAM nanogels, poly(AM-co-AMPSA) nanogels, PAM/SiO_2 composites and poly(AM-co-AMPSA)/SiO_2 composites are in the range of 36-76 nm, 63-125 nm, 38-76 nm, 44-77 nm respectively as determined by Dynamic light scattering (DLS). Fourier transform infrared spectrophotometer (FTIR) and ^{1}H-Nuclear magnetic resonance spectrometer (^{1}H-NMR) studies confirm the occurrence of copolymerization between the two monomers. Besides, presence of silica particles in the polymer latex particles, interaction of polymer chains with silica particles and interaction of silica with AMPSA groups are also confirmed by FTIR. The copolymer chain composition were measured by elemental analysis while thermal properties, morphology and shape of nanogels as well as nano size composites were measured by Thermogravimetric analyzer (TGA) and Differential scanning calorimeter (DSC), Scanning electron microscope (SEM) and Transmission electron microscope (TEM) respectively. The onset degradation temperature increase from 227^{o}C to 262^{o}C in copolymer-silica composite indicates improved thermal stability. The shifting of glass transition temperature from 194 ^{o}C to 203 ^{o}C of composite copolymeric nanogels further confirmed the existence of strong interactions of silica filler with chains. Also the chemical composition of polymeric chains and the affinity of polymer chains and silica influenced the morphology of nanogels.
7.	Keywords : W/O microemulsion polymerization, nanogels, acrylamide, 2-acrylamido-2- methyl-1-propanesulfonic acid, silica nanoparticles