Manufacturing of Polymer Materials in Supercritical Fluids

Millions of tons of industrial pollution are being produced per year by developing countries due to the waste disposal to environment form polymer industries. This has imposed the need green methodologies of production of polymer based composite materials in support of the pollution prevention at source.

SCFs are the green alternative media to traditional organic solvents involved in the processing of polymer based materials . They are produced through liquefaction of gases and low boiling liquids and operated above their critical points. The natural abundance of materials producing SCFs allows their substantial availability to manufacturers. SCFs offers limited number of industrial applications emphasizing extraction and purification of biomolecules, foods, pharmaceuticals, biomass pretreatment, enzyme immobilization and dying.

Presently, no consistent procedures are available for manufacturing the polymer based nanocomposite materials in SCFs

Advantages:

1. The natural abundance of gases and fluids producing SCFs allows their ease of availability to manufacturers at a low cost.
2. The technology circumvent the disposal of toxic solvent residues to environment is green friendly as this allows complete recycling and leaves no solvent residues into product.
3. Processes executed in SCFs , particularly SCC operates at ambient temperatures with substantial reduction in time, space and monitory, expenditures associated with solvents and electricity.
4. The pressurized environment of SCFs allows superior dispersion and compatibility of fillers, additives, colorants and antioxidants over the traditional process involving organic reaction media.
5. The products involving antimicrobial fillers render uniform activities against pathogens over long span of time. The materials may offer their potential applications as coating for the appliances wherein periodic sterilization are required.
6. The products involving polymeric and biodegradable fillers are of immense durability and degradable in presence of common pathogens. The materials may be used as construction of structures and anticorrosive coatings.
7. The products involving electroactive fillers display high charge storage and may be used for development of electrodes for batteries.