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ENGINEERING AT THE NANO AND MICRO-SCALE SCALE: A STRATEGY FOR DEVELOPING HIGH PERFORMANCE FUNCTIONAL MATERIALS FROM WASTE PLASTICS AND RUBBERS

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The end-of-life of all polymeric materials (neat polymers, blends and composites) has become a great challenge, due to environmental concern and to international and national regulations. Among all the possible ways to manage polymer waste, a hierarchy could be established. The most preferred option is the minimization of waste, followed by reuse of materials in the same application, recycling in another application (including recovery of monomers or low-weight molecules), incineration with energy recovery and finally incineration without energy recovery or land filling. Recycling of polymers that used to end up only at city landfills or incinerators is increasing around the world. As with any technological trend, the engineering profession plays an important role. Discarded polymer products and packaging make up a growing portion of Municipal Solid Waste (MSW). The Environmental Protection Agency (EPA) estimates that by the year 2010, the amount of plastics throw away will be 50% greater than at the beginning of the 1990s. EPA also says that polymer waste accounts for about one-fifth of all waste in the waste stream. Over the past two decades, recycling of polymers has dramatically increased. In the proposed talk all the recent trends in polymer recycling will be discussed. This will include melt recycling, monomer recycling, thermal depolymerisation, heat compression process and more efficient solid state pulverization process. Very specific cases of polymer blend recycling will be discussed which include thermoplastic-thermoplastic, rubber-rubber, rubber thermoplastic etc. Finally attention will be given to the manufacture of high performance micro and nano scale polymeric materials from industrial polymer waste.

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