Università degli Studi di Salerno

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Hybrid and Nanostructured Materials Resulted From Multiblock Copolymers Polybutadiene-Polystyrene: Synthesis and Applications

PhD thesis in Chemistry – X Cycle

Abstract.

The aim of this PhD thesis in Chemistry, with large feature of exploration and innovation, has been to develop hybrid organic-inorganic materials with control of the morphology at the nanometer scale. In particular were prepared materials based on gold nanoparticles included in the matrix of multiblock copolymers syndiotactic polystyrene-co-1,4-cis-polybutadiene (**sPSB**). The hydrophobicity, crystallinity and morphology of the polymer matrix has enabled the design of catalysts for the oxidation of alcohols which operate in eco-friendly conditions. In fact, the reaction was carried out using oxygen as oxidizing agent and, in some cases, water as a solvent. The oxidation of primary alcohols was carried out with high selectivity towards the formation of aldehydes. Beside, were also investigated some aspects of the reaction mechanism and has been formulated a preliminary hypothesis of the catalytic cycle.

New functional nanostructured polymeric materials were obtained by functionalization of the diene units of the sPSB copolymers with thioacetate, thiol, and sulfonic acid groups. The sulfonated copolymers sPSB (**sPSB-*SA***) have proved to be particularly stable thermally and films obtained by spin-coating of these polymers showed a good and selective proton conductivity found in domains of nanometer scale.

The copolymers sPSB-*SA* were also found very efficient acidic catalysts. The reaction of esterification of fatty acids with glycerol, of potential interest for the recovery of fatty acids and oils for the production of bio-fuels, is catalyzed effectively using 0.25÷1.0% by weight of catalyst in the temperature range 120÷180°C .

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