

Comparative Appraisal of Polymeric Matrices Synthesis and Characterization Based on Maleic versus Itaconic Anhydride and 3,9-Divinyl-2,4,8,10- Tetraoxaspiro[5.5]-Undecane

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Abstract : In the last decade, the attention of many researchers is focused on the synthesis of innovative “intelligent” copolymer structures with great potential for different uses. This considerable scientific interest is stimulated by possibility of the significant improvements in physical, mechanical, thermal and other important specific properties of these materials. Functionalization of polymer in synthesis by designing a suitable composition with the desired properties and applications is recognized as a valuable tool. In this work is presented a comparative study of the properties of the new copolymers poly(maleic anhydride maleic-co-3,9-divinyl-2,4,8,10-tetraoxaspiro[5.5]undecane) and poly(itaconic-anhydride-co-3,9-divinyl-2,4,8,10-tetraoxaspiro[5.5]undecane) obtained by radical polymerization in dioxane, using 2,2'-azobis(2-methylpropionitrile) as free-radical initiator. The comonomers are able for generating special effects as for example network formation, biodegradability and biocompatibility, gel formation capacity, binding properties, amphiphilicity, good oxidative and thermal stability, good film formers, and temperature and pH sensitivity. Maleic anhydride (MA) and also the isostructural analog itaconic anhydride (ITA) as polyfunctional monomers are widely used in the synthesis of reactive macromolecules with linear, hyperbranched and self & assembled structures to prepare high performance engineering, bioengineering and nano engineering materials. The incorporation of spiroacetal groups in polymer structures improves the solubility and the adhesive properties, induce good oxidative and thermal stability, are formers of good fiber or films with good flexibility and tensile strength. Also, the spiroacetal rings induce interactions on ether oxygen such as hydrogen bonds or coordinate bonds with other functional groups determining bulkiness and stiffness. The synthesized copolymers are analyzed by DSC, oscillatory and rotational rheological measurements and dielectric spectroscopy with the aim of underlying the heating behavior, solution viscosity as a function of shear rate and temperature and to investigate the relaxation processes and the motion of functional groups present in side chain around the main chain or bonds of the side chain. Acknowledgments This work was financially supported by the grant of the Romanian National Authority for Scientific Research, CNCS-UEFISCDI, project number PN-II-132/2014 “Magnetic biomimetic supports as alternative strategy for bone tissue engineering and repair” (MAGBIOTISS).

Keywords : Poly(maleic anhydride-co-3, 9-divinyl-2, 4, 8, 10-tetraoxaspiro (5.5)undecane); Poly(itaconic anhydride-co-3, 9-divinyl-2, 4, 8, 10-tetraoxaspiro (5.5)undecane); DSC; oscillatory and rotational rheological analysis; dielectric spectroscopy

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