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New Biobased(Furanic-Sulfonated) Poly(esteramide)s

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Abstract : The growing interest in vegetal biomass as an alternative for fossil resources has stimulated the development of numerous classes of monomers. Polymers from renewable resources have attracted an increasing amount of attention over the last two decades, predominantly due to two major reasons (i) firstly environmental concerns, and (ii) secondly the use of monomers from renewable feedstock is a steadily growing field of interest in order to reduce the amount of petroleum consumed in the chemical industry and to open new high-value-added markets to agriculture. Furanic polymers have been considered as alternative environmentally friendly polymers. In our earlier work, modifying furanic polyesters by incorporation of amide functions along their backbone, lead to a particular class of polymer 'poly(ester-amide)s', was investigated to combine the excellent mechanical properties of polyamides and the biodegradability of polyesters. As a continuation of our studies on this family of polymer, a series of furanic poly(ester-amide)s bearing sulfonate groups in the main chain were synthesized from 5,5'-Isopropylidene-bis(ethyl 2-furoate), dimethyl 5-sodiosulfoisophthalate, ethylene glycol and hexamethylene diamine by melt polycondensation using zinc acetate as a catalyst. In view of the complexity of the NMR spectrum analysis of the resulting sulfonated poly(ester-amide)s, we found that it is useful to prepare initially the corresponding homopolymers: sulfonated polyesters and polyamides. Structural data of these polymers will be used as a basic element in 1H NMR characterization. The hydrolytic degradation in acidic aqueous conditions (pH = 4,35) at 37 °C over the period of four weeks show that the mechanism of the hydrolysis of poly(ester amide)s was elucidated in relation with the microstructure. The strong intermolecular hydrogen bonding interactions between amide functions and water molecules increases the hydrophilicity of the macromolecular chains and consequently their hydrolytic degradation.

Keywords : furan, hydrolytic degradation, polycondensation, poly(ester amide)
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