

Development of New Biodegradable Polymers for Selected Biomedical Applications

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Abstract:

High molecular weight biodegradable amphiphilic multiblock copolymers, formally poly(ether-ester-urethane)s were synthesized by condensation polymerization of PCL diol and PEG segments with 1,6-hexamethylendiisocyanate as coupling agent in the presence of dibutyltin dilaurate as catalyst. Different stoichiometric ratios of the hydroxyl end groups and isocyanate functionalities were utilized to produce copolymers with various characteristics in terms of chemical composition, molecular weight, and hydrophilicity. FT-IR, ^{1}H-NMR, and GPC confirmed the chemical composition and the molecular weight of the formed multiblock copolymers. The crystal structure of the copolymers was studied using DSC, TGA, and WAXD. The contact angle measurements allowed correlating the hydrophilicity of the polymer surface to the polymer composition produced. The prepared multiblock copolymers were explored for the fabrication of biodegradable nano/microfibrous scaffolds using the electrospinning technique. Different working parameters such as spinning voltage, needle-to-collector distance, flow rate and polymer concentration were adjusted to obtain electrospun fibers with the required morphological characteristics. The ultrafine fibers developed were characterized for size and morphology using scanning electron microscopy. The results obtained showed that the fibers obtained have good morphological characteristics and varied in size between 90 and 116 nm. The developed ultrafine fibers were investigated as a dual function cell regeneration and drug delivery scaffold for selected biomedical applications. The scaffold was loaded with chlorhexidine to confer antimicrobial activity, of importance in applications such as wound healing. Chlorhexidine-eluting ultrafine fibers were characterized using IR and DSC.
Ultrafine fibers with modulated properties controlled the release of chlorhexidine for more than 6 weeks according to a biphasic release profile for two formulations.

Biography:

I have got Bachelor degree of Science from Alexandria University at Special Chemistry with a final grade of very good. I have got a master degree at Materials Science with grade point average of B+. I have enrolled in PhD program at Materials Science as well. I had oral presentation entitled "Chlorohexidine Nanofibers for Antimicrobial Biomedical Applications" in

international conference organized by Arab Society of Materials Science (ASMS). I have attended Drug Delivery summer school offered by Summer University DTU. Currently, I work in Central Laboratories, Ministry of Health. In our lab we use techniqual Tools for analysis water and the variety of foodstuffs.

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