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Synthesis and Characterisation of Fatty Acid and Amino Acid.

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Abstract

In this paper we discuss the synthesis and self assembling behavior of new copolymers derived from fatty acid/ amino acid components. The dimers of linoleic acid (DLA) and tyrosine derived diphenols containing, alkyl ester pendent chains designated as "R" DTR, specific pendent chains were of ethyl (E) and hexyl (H). The polymer were found to be spontaneously self assemble into nanoparticles with size in range 196-239 nm and critical micelle concentration (CMC) of 0-125-0-250 mg/ml. the self organization of these new polymeric system into micellar and nanospheric structures in aqueous environment was evaualted using ultra violet/visible UV-vis spectroscopy.

For example. vitamins or antibacterial peptides for antibacterial coatings on medcal devices.

Key words : micelle, Fatty acid, copolymers amphiphilic block copolymers,

Synthetic Polymers have played an important role in medical therapies being applied in areas such as modulation of wound healing implantable medical devices and artificial organs, prostheses bone repair and drug delivery system. However on of the major factors limiting the use of these materials their bio compatibility. The most common hospital infection occur for four major body sites, leading to there description by the US center of disease control prevention (CDC) as the big four namely. surgical site infection (SSI), Pneumonia (PNEU), Blood stream infection BSI urinary tract infection (UTI),

Tyrosine Derived monomers (DTR) Dimerized Fatty acid, A hydrogenated DLA, molecular Weight-570 g mol^{-1}, (970 $gmol^{-1}$ From GPC with dispersity index of (1.04) – COOH Number 196 mg/g, 1- ethyl – 3- 3-

dimethyllaminopropyl cardodiimidle. hydrochloride. (EDH.Hcl) PEG and Polyethylene glycol methyl ether (mPEG) of different molecular masses. Other chemicals such as polyvinyl alcohol 30-70 KDa and 4- dimethylaminopyridine (DMAP), all solvents of high performance liquid chromatograpy (HPLC) grade were used without further purification[1-6].

Synthesis : Poly (aliphatic/aromatic – ester – amide ether)$_s$ (PAAEAE) were synthesized using 1-ethyl-3- (3-dimthyll aminoropyl) carbodiimide hydrochloride (EDC-Hcl) as the coupling agent and for 4-dimethylaminopyridine, (DMAP) as the catalyst in dichloromethane solution (DCM of room temperature in an inert gas atmosphere). poly (aliphatic/aromatic ester gas amid ether) were synthesized as foll ows DLA (1.05 equivalent) DTE (des amino tyrosyltyrosine ethyl ester) and DMAP (0.4 equivalent) were placed in 100mL round bottomed flask, then dichloro methane was added and after compound dissolved 4 equivalent of EDC. HCl was added the rection mixture, was cooled down to 0^{o}C and stirred for 2h. the rection mixture was removed from the ice bath and allowed to warm up to room temperature with continuous stirring. For 24h. after 24h PEG or mPEG of molecular masses 1000g/mol or 5000g/mol was added to the rection mixture and was continuously stirred for the next 24h. follwing 24h additional stirring the rection mixture was precipitated with propanol, the ppt was dried, dissolved in 10mL of methylene chloride. and reprecipitated 50mL of methanol, this stage was also important to remove the inispiator. the synthesis scheme of poly (aliphatic/aromatic-esteramide ether)[1-6].

Characterization :

FTIR/ ^{1}H NMR The chemical structure of polymers was characterized by Fourier transform infrared spectroscopy (FTIR) and by Nuclear magnetic resonance spetroscopy (^{1}H NMR). The polymeric material was spread on to a sodium chloride plate and transmission spectra.

Gel permeation chromatography – (GPC)

GPC experiments were performed to determine the molecular mass distributrion and dispersity index the GPC system consist of a 515 HPCL pump, a 717 Plus as auto sampler, and a 410 RI detector. two PL gel columns 1x103 and 1x10^5 A. were used in series with THF as the mobile Phase at a flow rate of I ml/min. the samples. were dissolved in THF to give a concentration of 10 mg/ml and 20 µLwas injected.[1-6]

The chemical structure of new PAAEAE copolymers was verificd spectroscopy. first esterification of DTH (DTE) with DL A was Performed and the functional groups were identified with FTIR spectroscopy. Based on FTIR spectrum of DTE derivative. characterstic for Ar-OH group at 3380 cm^{-1} and intense peak charactertstic for strutching vibrations of C=O goup (1710 cm^{-1}) can be seen and these disappear after the reaction with D.L.A. An intense double peak in the range 3000-2800 cm^{-1} in observed for DLA and it is ascribed to methylene – CH_2 – group, there intense double – peak characteristic for stretching vibration of C=O group (1705 cm^{-1}) The spectrum for estrification product of DTR-DLA shows a new Peak. at 1754 cm^{-1} the spectrum for estrification product of DTR-

DLA shows a new Peak. at 1754 cm^{-1} characteristic for streching vibration of the ester group the disappearance of peak at 1705-1710 cm^{-1} charactristic for Ar-OH and C=O group in also observed.

Concluison

We successfully synthesized new polymeric materials based on amino acid, fatty acids and PEG of different molecular masses. spectroscopic methods revealed, functional groups characteristic for poly (aliphatic/ aromatic ester amide- ether). The GPC results demonstrated a random copolymer structure of the obtained materials as well as lower molecular masses lower for polymers containing the hexyl ester derivative of tyrosine and PEG of high molecular masses.

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