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The Modification of Poly amidoamine (PAMAM-$G_{0.5}$) by Cytosine

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ABSTRACT

The half generation Poly(amidoamine) (PAMAM) dendrimers was synthesized and characterized and modification by heterocyclic DNA base (Cytosine) . The conjugated Cytosine modified detected by FT-IR, ^{1}H NMR, ^{13}C NMR and Mass spectroscopy analysis.

Keywords: Component; Polyamidoamine; PAMAM; Cytosine

1. Introduction

Dendrimers are molecules with three-dimensional structure of certain branches around a central core which were synthesized by processing stage or repeated synthesis. Also dendrimers have been identified alike the arborols, starburst, ascade and Cauliflower polymers. Dendrimers are Unique molecular structure of polymer materials like balls that contain a Initiator core, repeat units and Surface terminal group. Those are spherical configuration in high Generation. For the first time we have inventived new models for determination molecular weight dendrimers AB2-type [9,12]. Dendrimer polyamidoamine (PAMAM) as one of commercial ones [10,13] due to the controllable mass, the water solubility, and the possibility of surface functionality, has been widely used in the biomedical and genetics [10]. The large numbers of surface functional groups on dendrimer's outer shell can be modified or conjugated with a variety of interesting guest molecules [11,14]. PAMAM was modified by different molecules ,in this study PAMAM was modified to cytosine. The modification PAMAM molecule properties is changed proportion to PAMAM molecule, in hence modification PAMAM can be conjugated with targeting molecules, dyes and drugs for different usage in science [5-8].

2. Experimental Process

2.1. Synthesis PAMAM Dendrimers Half Generation (G0.5) , EDA Core (PAMAM(G0.5)-EDA(Core),Z0=2)

The Synthesis PAMAM dendrimers half generation (G0.5), EDA Core (PAMAM(G0.5)-EDA(Core),Z0=2) A solution of freshly distilled 1,2-diaminoethane (5 g, 5.5 ml, 0.083 mol) in methanol (20 ml) was added dropwise to a stirred solution of methylacrylate (35 g, 37 ml, 0.407 mol) in methanol (20 ml), under nitrogen, over a period of 2 h. The final mixture was stirred for 30 min at 0°C and then allowed to warm to room temperature and stirred for a further 24 h. The solvent was removed under reduced pressure at 40° Cusing a rotary evaporator and the resulting yellow oil viscose under vacuum (10-1 mm Hg, 50°C) overnight to give PAMAM(G0.5)-EDA(Core (a) , the final product (3.64 g, 91.5%). The synthesis (a) in **Figure 1** is shown. 1738 cm -1 is ester C=O stretching absorption.13C-NMR ester groups carbon has appeared in 173.4 ppm. 1 H-NMR ester methyl group protons was appeared in 2.51 ppm. Full spectral data and characterizations (a) is given in **Table 1**.

2.2. Conjugated of Cytosine with G0.5 PAMAM Dendrimer

Cytosine (4.5 mmol) was dissolved in H2O at PAMAM(G0.5)-EDA(Core)(a) (4.95 mmol) was dissolved in MeOH, Then was added drop wise to the cytosine solution, at a molar ratio of cytosine/(a) ,4:1. After complete addition the mixture was stirred for 48h at room temperature and the resultant light yellow solid vacuum dried (10-1 mm Hg, 50°C) overnight to give the cytosine with PAMAM-EDA(Core) (b) (71.9%). It was detectable by FT-IR, 1H NMR, 13C NMR, and Mass spectroscopy analysis. The synthesis (b) in **Figure 2** is shown.

3. Results and Discussion

FT-IR spectra (a) ,(b) and cytosine was shown in **Figure 3 i, ii, iii** respectively. ester groups absorption in 1735.8 cm-1 which not presented in the cytosine spectra (**Figure 4 iii**) whereas disappeared thoroughly in (b) (**Figure 4 ii**). at CH2 groups anti-symmetrical stretching was obtained (a) at 2954 cm-1. of –NH and stretching vibrations was shown at 3285 cm-1 (**Figure 4i**). –NH stretching vibrations amide was shown at 1648

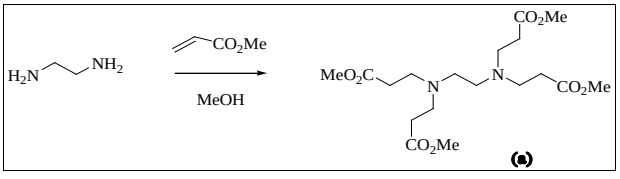

Figure 1. Synthesis PAMAM (G 0.5).

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Table 1. Spectral mode assignment for a , b and Cytosin.

Spectral data	*PAMAM $G_{0.5}$*		*Cytosine*		*PAMAM $G_{0.5}$(Cyt.)$_4$*	
	C=O stretching vibration ester groups	1735	C=O Stretching vibration amide	1725	C=O Stretching vibration amide	1566
FT-IR (cm^{-1})	C-O stretching ester groups	1203	C=N stretching vibration	1666	N-H bending vibration amide	1234.4
	C-N stretching vibration amine groups	1041	C-N stretching vibration	1234	C-N stretching vibration	1651
	C=O	173.1	C=O	166.9	C=O (core)	176.9
^{13}CNMR (ppm)	C-C=O		C-NH_2		C-NH-C=O	164.7
	CH_3	32.6 51.9	C-NH-C=O	171 158.1		
^{1}HNMR (ppm)	CH_2-C=O	2.46	CH (ring)	5.62	CH_2-C=O	2.28
	CH_3(end groups)	3.64			NH-C=O (new bond)	7.3
Mass (m/z)	404		111		483-564-644-720	

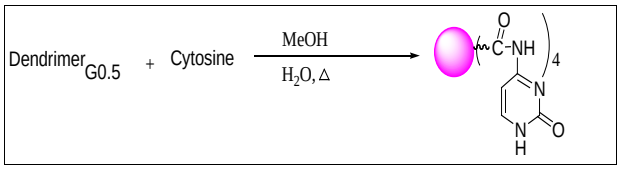
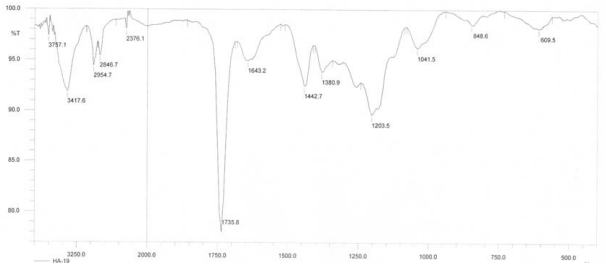
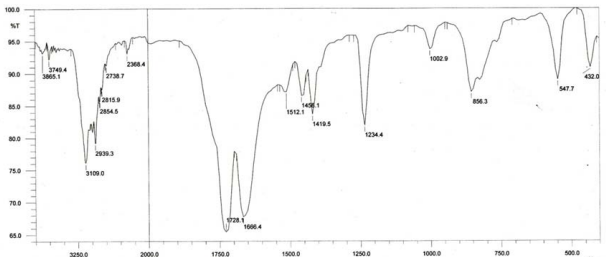


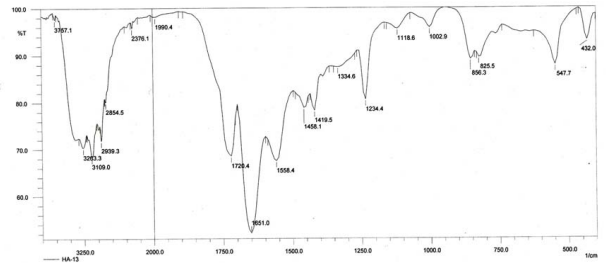
Figure 2. Synthesis PAMAM-EDA(Core)-Cytosin (b).



(i)



(ii)



(iii)

Figure 4. FT-IR spectral (a), (b) and Cytosine in this figure; i, ii, iii respectively.

cm-1 and 1558 cm-1 for amide I & II respectively. Also N–H bending vibrations amide was shown at 1648 and 1558 cm-1. Spectral data and characterizations (a), (b) and cytosine are given in **Table 1**.

4. Conclusions

In summary, conjugating cytosine with half generation of PAMAM dendrimer was successfully synthesized and characterized. PAMAMG0.5-Cytosine Systematic mass spectral analysis has shown that nearly theoretical masses are obtained for product (b)(or the mass spectra of this compound displayed molecular ion peaks at the appropriate m/z values or mass spectra on the other hand, give precise molecular weight information to compare with mathematically predicted molecular masses.), mass spectrometry of that gave a mass of 720 m/z (theoretical mass: 724m/z). Overall the spectral data clearly indicate the desired cytosine with PAMAM-EDA(Core) (b) is formed.

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