

Synthesis of Heterocyclic pendant on poly(vinyl alcohol)

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Abstract :

Reaction of Poly vinyl alcohol(PVA) with adipoly dichloride to produced new ester- acid chloride is very active to react with hydrazine hydride, then the products treated with 40% Potassium hydroxide(KOH) in Carbon disulphide(CS₂) and heated for 6 hours with reflux to yield heterocyclic (3- Thio pyrazole) on PVA. The prepared polymers were identified by FF-IR and H-NMR spectra and some physical properties such as softening and melting points , solubility , and thermal stability were studied.

Key word: PVA, pyrazol derivative.

Chemistry classification:QD241-441

Introduction of Poly vinyl alcohol (PVA):-

Poly Vinyl alcohol (PVA): A poly hydroxyl polymer is the Largest Volume Synthetic , water soluble polymer produced in the world⁽¹⁾. Poly Vinyl alcohol (PVA) has a relatively simple Structure and its modification are possible by Simple Chemical reactions.

Poly Vinyl alcohol (PVA) has been used for various pharmaceutical and biomedical application because of its properties which are characterized by being non-toxic, non-carcinogenic, and bioadhesive. These properties made (PVA) capable of simulating natural tissue and can readily accept into the body⁽²⁾.

According to the study which had been made by research group ,and according to the biological fat of (PVA), it was strongly suggested that (PVA) can be used as drug Carrier⁽³⁾. PVA is white crystals tending to yellow , found in different size particles .

Poly Vinyl alcohol PVA is only soluble in highly polar solvents , such as water , dimethyl sulfoxide (DMSO) , acetamide , glycols , dimethyl formamide (DMF) .

The solubility in water depends on its degree of polymerization and hydrolysis, PVA is slowly soluble in cold water but it is easily soluble in hot water .

PVA Reaction:

Poly Vinyl alcohol PVA is considered as linear vinyl polymers which contain secondary hydroxyl groups so PVA considers as secondary alcohol simple difference in the rate of reaction because of steric effect ⁽⁴⁾.

Modified Poly Vinyl alcohol PVA containing biological active groups: ⁽⁵⁾.

Many examples of modified PVA containing biologically active groups have been made since 1974.

Physical properties for new poly(vinyl alcohol) and new ester derivatives

Table (1)

No.	Poly	time	% Yield	colour	Meltig point	Softin g point
1	Poly (vinyloxy adipoly chloride)	6 hrs.	72	Black gray	179-181	183-189
2	Poly (vinyloxy adipic acid hydrazide)	6 hrs.	84	Black gray	203-205	185-190
3	Poly hetero cyclic (3-thiopyrazole)	6 hrs	81	gray	209-211	195-204

**Solubility of new polymer
Table(2)**

No.	Benzene	DMF	DMSO	THF	Water	CCl4	Acetone	EtOH
1	V.S	V.S	V.S	V.S	P.S	P.S	V.S	V.S
2	V.S	V.S	V.S	V.S	P.S	P.S	V.S	V.S
3	V.S	V.S	V.S	V.S	P.S	P.S	V.S	V.S

Table (3): FTIR absorption spectra data (cm)⁻¹ of new prepared polymers

Fig. No.	Comp. No.	ν C-O Acid	ν C-O -OH	ν C=O acid	ν C=O ester	ν C-O-C	ν C-H bending	ν C-H aliphatic	ν N-H	ν NH ₂	ν C-S
1	Poly (vinyl oxy adipoyl chloride)	-		1650	1665	1088	1370,1459	2900	-	-	-
2	Poly (vinyl oxy adipic acid hydrazide)	-	-	1600	1730	1088	-	2900	3200	3340	-
3	Poly hetero cyclic (3-thiopyrazole)	-	-	1665	1730	1088	-	2850	2250		1400

Table (4): ¹H-NMR spectra for selected polymers

Comp. No.	¹H-NMR parameters (ppm) δ-H
1- Poly vinyl Alcohol	3.2 (t, 2H, -CH ₂); 2.5 (m, 1H, -CH),
2- Poly adipol hydrazide	7.89 (s, 1H, -NH); 6.9 (s, 2H, NH ₂); 3.4 (m, 2H, -CH ₂); 3.1 (t, 2H, -CH ₂); 2.8 (m, 1H, -CH)

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تخليق مركب حلقي على البولي فانييل الكحولي
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الخلاصة :

تفاعل بولي فنييل الكحول (PVA) مع adipoly dichloride لإنتاج كلوريد حوامض أسترية جديدة والتي لها قدرة عالية على التفاعل مع hydrazine hydrate مع التسخين لمدة 6 ساعات ، ومعاملتها مع 40% KOH بوجود CS₂ والتسخين لمدة 6 ساعات مع التصعيد ينتج hetrocyclic (3- Thio pyrazole) مع PVA شخّصت هذه البلمرات بمطيافيه FTIR, H-NMR, وتم أخذ الخواص الفيزيائية لها مثل نشاط التلّين (أو الأنصهار) ، الذوبانية ودراسة أستقراريتها حرارياً.

الكلمات المفتاحية :

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