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SURFACTANT PROPERTIES OF NOVEL POLYMERS BASED ON GLYCEROL, SORBITOL, MALEIC ANHYDRIED AND PHTHALIC ANHYDRIDE

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ABSTRACT

In this piece of research we synthesized polymers mainly based on glycerol, sorbitol, maleic anhydride, phthalic anhydride and small quantity of polyethylene glycol (400), sodium bisulphate and sodium bisulphite. Synthesized novel polymers were analyzed for % solids, pH, and viscosity and H.L.B ratio. These novel polymers were bended with 10-20% sodium lauryl ether sulphate and sodium lauryl sulphate and analyzed for surfactant properties like pH, foam and surface tension by standard laboratory methods. These blends were used for formulation of liquid laundry detergent and compared with commercial samples in respect of physicochemical and cleansing properties.

INTRODUCTION

All petroleum based surfactants are hazardous to eco-system due to this surfactant aquatic ecosystem get damaged also they directly affect living organisms. In search of ecofriendly surfactants synthesized novel polymers based on mainly product of vegetable origin like glycerol and sorbitol. Glycerol is by product of biodiesel industry and is also obtained from vegetable oils or fats. Polyethylene glycol (400) is polymer which is water soluble and non toxic in nature.

In this piece of research work we synthesized polymers mainly based on glycerol[1], sobitol [2], polyethylene glycol (400)[3] which contain small amount of acids like maleic anhydride [4] and phthalic anhydride [5] .Sodium bisulphate ($NaHSO_4$) and sodium bisulphite ($NaHSO_3$) act as a catalyst as well they react with OH groups in polyols.

Blending of novel polymer with 10-20% Sodium lauryl ether sulphate (S.L.E.S) and Sodium lauryl sulphate (S.L.S) has been studied .This blending was essential to boost foaming and detergency characteristic in the novel polymer synthesized in laboratory.

MATERIAL AND METHODS

Reaction programming and steps in synthesis of polymers:

The preparation of Novel polymers was carried out in a glass reactor. The reactor consists of two parts. Lower part of the reactor is a round bottom vessel of 2 L capacity with very wide mouth. The upper port of the reactor is its lid, having four necks with standard joints. A motor driven stirrer was inserted in the reactor through the central neck, while another neck was used for thermometer. A condenser was fitted with the reactor through the third neck and the fourth neck was used for dropping the chemicals in to the reactor. The Reactor was heated by an electric heating mantle having special arrangements for smooth control of the temperature [$\pm 2^0$C] of the reactor. A regulator controlled the speed of the stirrer. The reaction vessel and its lid were tied together with help of clamps.

All the ingredients [as given in Table1] were heated to 130^0C for three hours in glass reactor. After three hours heating was stop and mass cooled to room temperature.

Analysis and Testing:

The synthesized polymers were analyzed for % solids, viscosity, pH and H.L.B ratio by standard laboratory methods [6-8]. Polymers were bended with 10-20% Sodium lauryl ether sulphate (S.L.E.S) and Sodium lauryl sulphate (S.L.S) to get useful composition. Blended compositions were analyzed for Foam and surface tension at 1% concentrated solution by standard laboratory

methods [9-10]. Selected polymeric surfactant used for formulation of liquid detergents and compared with commercial once.

TABLE NO 1: COMPOSITION OF NOVEL POLYMERS

Sr.No.	Polymer (Ingredients in %)	P17	M18
1	Glycerol	75	75
2	Polyethylene Glycol (400)	5	5
3	Sorbitol(70% solids)	10	10
4	Maleic anhydride	-----	5
5	Phthalic anhydride	5	----
6	$NaHSO_4$	2.5	2.5
7	$NaHSO_3$	2.5	2.5

TABLE NO 2: PHYSIOCHEMICAL ANALYSIS OF NOVEL POLYMERS

Sr.No.	Polymer Properties	P17	M18
1	% Solids	93.20	93.00
2	pH(1% solution)by Digital pH meter	3.8	3.81
3	Viscosity In Seconds (ford cup no4. At 30^0C)	185	195
4	H.L.B Ratio	17.7	17.6

TABLE NO 3:

COMPOSITION OF BLENDED POLYMERS BASED ON COMBINATION WITH SODIUM LAURYL ETHER SULPHATE AND SODIUM LAURYL SULPHATE

Blend	Polymer (% by weight)	S.L.E.S (% by weight)	S.L.S (% by weight)	Foam Volume (cm^3)by Glass cylinder method	Surface Tension (dyne/cm)
B1	P17 (90%)	10	---	500	21.90
B2	P17 (90%)	---	10	650	32.76
B3	P17 (80%)	20	---	650	20.33
B4	P17 (80%)	---	20	750	25.43
B5	M18 (90%)	10	---	600	22.47
B6	M18 (90%)	20	---	800	20.73
B7	M18 (80%)	---	10	700	32.86
B8	M18 (80%)	---	20	860	24.46

TABLE NO 4: LIQUID DETERGENTS BASED ON BLENDED POLYMERS B5

Sr.No	Ingredients used in % by weight	LD1	LD2
1	B5	10	14
2	Acid slurry	10	6
3	Sodium lauryl ether sulphate	10	10
4	Sodium lauryl sulphate (40% Solids)	2	2
5	Sodium carbonate	5.5	5.5
6	Polyvinyl alcohol(20% Solids)	3	3
7	Urea	0.5	0.5
8	Sorbitol	9	9
9	Water	50	50

TABLE NO: 5 ANALYSIS OF LIQUID DETERGENTS BASED BLEND B5

Sr.No	Liquid detergents	Foam Volume (cm^3)by Glass cylinder method			Surface Tension(dyne/cm)
		0 min	10 min	15 min	
1	LD1	1000	990	850	30.48
2	LD2	1000	1000	870	30.08
3	CLD1	1000	1000	890	29.00
4	CLD2	980	980	830	30.28

Note:- CLD1- Commercial Liquid detergent-1, CLD2- Commercial Liquid detergent-2.

RESULTS AND DISCUSSION

1) Polymers were synthesized using glycerol, polyethylene glycol (400) , phthalic anhydride and Maleic anhydride as main ingredients with small amount of sorbitol, sodium bisulphate and sodium bisulphite.

2) Two combinations were synthesis one using phthalic anhydride (Polymer P17) and other containing maleic anhydride (Polymer M18) as given in Table 1. The blend containing maleic give better cleaning efficiency here was used to formulate liquid laundry detergent.

3) Physicochemical analysis of polymers is given in Table 2. Polymers are in liquid state and have pH 3.8 (pH of 1% solution). Polymers have 93.00 to 93.20 % solids. H.L.B ratio of polymers was

found in rang 17.6 to 17.7, this ratio suggest the use of these polymers in detergent compositions.

4) Liquid detergents based on blend B5 were given in Table 4.

5) The comparative analysis of commercial liquid detergent with our liquid laundry detergent is given in Table 5.

CONCLUSION

The following concussions stand confirm in the light of above research.

1) Novel polymers were synthesized based on ecofriendly vegetable based ingredients like glycerol and sorbitol. In one composition maleic anhydride has been used while phthalic is used in other composition.

2) The physiochemical analysis like % solids, pH, H.L.B ratio polymers and their blend with S.L.E.S and S.L.S are reported in this work. The analysis suggests blends with S.L.E.S and S.L.S can be used as active ingredients in liquid detergent formulations.

3) Liquid laundry detergents have been formulated based on novel polymers and these liquid detergents have been compared in reference to foaming, surface tension and cleaning with commercial samples. Our samples are on par or some time better than commercial samples.

4) These formulation must be tried on commercial scale. This will open up new horizon of ecofriendly products.

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