EXPLORATORY STUDIES IN PTFE BASED DISPERSION

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ABSTRACT

PTFE is thermoplastic polymer which is a white solid at room temperature. PTFE is hydrophobic and has one of the lowest coefficients of friction as compared to any solid. It has a density of about 2200 Kg/m^3 and the melting point is 600 K (327 °C). Additionally it has good dielectric properties, high electronegativity, and low chemical reactivity. The number of mers (sub units) in PTFE is essentially infinite and can be considered to be the size of the object that is being formed or coated with PTFE. It is observed that the dispersion polymer, which is of finer particle size and lower molecular weight, gives products with a vastly improved resistance to flexing and also distinctly higher tensile strengths. Owing to the inert characteristic of PTFE, its disposal has become a big challenge. Generally used PTFE is converted into smaller particles and used as fillers. One of its properties of low friction there is a possibility of making dispersion in a suitable solvent which can use as a lubricant. Although there are commercial PTFE dispersion available for coating and lubrication, they are made of very low micron – sized particles. This particle size can be achieved by in situ emulsion polymerization of TFE or by exposing shredded PTFE to Electron Beam. The former will give only a particular type of dispersion and depends on the interest of the industrial manufacturing it. There is a possibility of getting PTFE of 15-20 µm particle size with a very low exposure of gamma radiation which is much economical as compared to electron beam. The present work is an attempt to check the quality of the coating on various substrates. Exploratory studies were done to find the effect of PTFE, solvent and surfactant loading on the stability of the dispersion.

Keyword: - *PTFE1, Dispersion2, Polar-nonpolar and Organic Solvent3, Surfactant4, Lubrication5*

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1. Introduction

Polytetrafluoroethylene (PTFE) is a synthetic fluoropolymer of tetrafluoroethylene that has numerous applications. The best known brand name of PTFE-based formulas is **Teflon** by Chemours.PTFE was accidentally discovered in 1938 by Roy Plunkett while he was working in New Jersey for DuPont. As Plunkett attempted to make a new chlorofluorocarbon refrigerant, the tetrafluoroethylene gas in its pressure bottle stopped flowing before the bottle's weight had dropped to the point signaling "empty."Since Plunkett was measuring the amount of gas used by weighing the bottle, and finally resorted to sawing the bottle apart. He found the bottle's interior coated with a waxy white material that was oddly slippery. Analysis showed that it was polymerized perfluoroethylene, with the iron from the inside of the container having acted as a catalyst at high pressure. Kinetic Chemicals patented the new fluorinated plastic (analogous to the already known polyethylene) in 1941, and registered the Teflon trademark in 1945.

1.1 Aim and Objective

To prepare PTFE (Polytetrafluoroethylene) based dispersions using IPA (Isopropyl alcohol) and water as solvents and various ionic and non-ionic surfactants. To investigate the stability and properties of dispersions.To study the effects of PTFE loading, surfactant quantity and the solvent quantity on the stability bases.To use these dispersion for coating a various substrates like metal and non-metal. To used 5 to 10 micron size of PTFE, When we use this dispersion applicant for lubricants used as Greece oil.To used this PTFE dispersion used as green oil.

1.2 Problem Specification

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2. Matrieal and Method

1. Experiments were performed by PTFE, IPA and Surfactant, varying one of these and keeping the other constant. The steps involved during the experiment are given below.2. For a fixed quantity of PTFE (1-4 gm) and 2 to10 ml of IPA, the surfactant quantity was varied from 0.02 to 0.05g.The details are given in below Table below.3. Similarly, formulations were also prepared by keeping solvent quantity (8ml) and surfactant fixed and PTFE loading was varied. The details are given in below table. We have done the practical of 36 test of CTAB solution .We have also done 24 practical of SLS solution.

Sr.no	PTFE (gram)	CTAB (gram)	IPA (ml)	After 5Min	After10Min	After (24 Hours)	After (4 Days)	After (8 Days)	After (15 Days)
1	3.50	0.05	8	5.84	5.82	5.67	5.52	5.39	5.35
2	3.50	0.010	8	6.2	6.12	5.96	5.88	5.81	5.72
3	3.50	0.015	8	5.74	5.68	5.56	5.56	5.49	5.42
4	3.50	0.020	8	5.95	5.91	5.84	5.84	5.76	5.68
5	3.50	0.025	8	6.16	6.16	6.15	6.15	6.15	6.15
6	3.50	0.030	8	6.13	6.07	5.98	5.91	5.85	5.78

(**Table 1**: Composition of loading of PTFE with various compositions)

3.RESULT

We have done some practical of various composition mixing with PTFE and get some stable solution dispersed with PTFE solution and get some solutions.Find the properties

Sr No.	Test tube no.	Ntu	Turbidity	Ntu	Turbidity	Viscosity
1	4	200	29.2	2000	26.2	293.8
2	18	200	26.1	2000	25.5	268.78
3	28	200	25.2	2000	26.2	260.78

(Table 2 : Result of CTAB solution **)**

3.1 Application

This is the related to figure which we are using the stable CTAB solution .We applied on Figure 1 to 3.

Figure 1: Stainless Steel

Figure 2: Aluminum

Figure 3: Glass .

4. CONCLUSIONS

We had performed experiment using CTAB and SLS. Based on experiment we conclude that CTAB solution is failed during application. Coating of PTFE on SLS is satisfactory and application is successful. Our PTFE dispersed solution is cheap than lubricant oil. We also conclude that from this experiment we can use also the amount of molecular species which make high stability 0.1 wt. % to about 20%.Example: Polyacrylic acid, polyvinyl alcohol, Polyethylene Glycol when this additives used don't added surfactant. It's also applied on coating replaced as lubricant because its cost is 1.5Rs./ml.

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6. REFERENCES

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