



Preparation, Properties and Applications of Alkyl Acrylate and Styrene Based Polymers

Gajendra Gaur, Yogesh Kumar Sharma and Hemandra Kumar Tiwari*

Department of Chemistry, SwamiShraddhanand College, University of Delhi, Alipur, New Delhi- 110036

ABSTRACT

Butyl acrylate and styrene have various application e.g. paper coating, water proofing and paint manufacturing. In paper coating low cost and gloss performance is not ideal. In water proofing emulsion becomes thick and brittle at low temperature. In paint manufacturing, the product may be for residential purposes or industrial applications. Decoration and protection are two main purposes of all paints therefore the shelf life of paint film should be long.

Keywords: Paints, Coatings, Water Proofing, Styrene, Acrylic acid

INTRODUCTION

Acrylic polymers are also known as acrylics and the esters of acrylic and methacrylic acid are the monomers. The acrylates are represented by the common formula in which R = H for acrylates, R = CH₃ for methacrylates. The esters which are used in acrylates are methyl, ethyl, *n*-butyl, isobutyl, 2-ethyl hexyl, and octyl etc [1]. Monomers are known to be multifunctional for example trimethylol propane triacrylate/butylene glycol diacrylate. The acrylate have been widely utilized to increase the thickness of surface coatings [2]. The acrylates are having very good resistance against ultraviolet radiation, temperature, ozone, harsh chemicals, aqueous medium and alcoholic mediums. In terms of applications the acrylates have been used as surface coating materials in [textiles](#). In case of styrene based polymers vinyl functional group may polymerized to form *polystyrene* and also used to

form copolymerization products with other acrylates and styrenes[3]. Polystyrene homopolymer i.e. styrene butadiene, styrene acrylonitrile and acrylonitrile butadiene styrene copolymers have been used to synthesize various versatile products[4]. The aim of our work is to get good weatherability and good stain resistance, wide tensile strength, to generate quality cross linking, to get good pigment-binding capacity, a product with good gloss, resistance to removal by detergents, adhesion to common substrates i.e. steel, aluminum and wood surfaces.

EXPERIMENTAL

Materials and method

Improvement which we have made styrene, acrylic emulsion significantly improves the gloss and smoothness of coated paper by changing the synthetic process. By this we also achieve improvement in water proofing and paint manufacturing.

We will discuss typical formulation of water proofing in this context [5].

The monomer butyl Acrylate (BA) and Styrene both materials of commercial grade were procured from IPCL Baroda, India; Acrylamide was purchased from S.D. Fine Chemicals, Boisar, India; Glacial Acetic Acid was obtained from Anabond India Ltd., Chennai, India; A-56 and OPS-25 were purchased from United Pestichem, Mumbai, India; Potassium Persulphate from S.D. Fine Chemicals, Boisar, India; TBHP was purchased from Yash Organic, Delhi, India and Decolite was procured from Transpek-Silox India Pvt Ltd, Vadodra, India [6]. All the chemicals used as received without further purification.

Table 1:

Item No.	Materials	Amount (gm)
1	DM Water	180.0
2	A-56	1.787
3	OPS-25	2.037
4	Formic acid	0.020
5	DM Water	95.400
6	Acrylamide	5.385
7	OPS-25	13.287
8	BAM	174.507
9	Styrene	130.500
10	GAA	9.225
11	PPS	1.425
12	DM Water	46.443
13	TBHP	0.800
14	DM Water	4.800
15	Decolite	0.0460
16	DM Water	2.100
17	Ammonia	5.300
18	DM Water	34.00
19	Formalin	0.600

We have four necked glass reactor out of four one is fixed for thermocouple .

A then B,C,D are for feeding the reactant to 5

1 to 4 is taken into base reactor which is having heating arrangement.

Now raise the temperature to 80 degree Celsius.

Then 5 to 10 mix well and placed in C which is in Centre.

Then 11 and 12 mix well and placed in vessel 13.

Then start the addition of mix 5 and 10 .addition should be in 4-5 hrs time slowly.
 Then hold for one hour at 80degree Celsius .then lower the temperature to 40 degree Celsius.Add one by one . first mix of 13 and 14 through D.
 Then mix well.Then start addition of 15 and 16 which is pre mixed before placing in D.
 At last 17 and 18. Then formalin in 19
 Final active matter should be 50+/- 1
 pH 7-8 [7]

RESULT AND DISCUSSION

First of all a functional test has been done in water proofing compounds and found that the prepared crystalline coating formulations were useful for integral waterproofing [8]
 Crystalline waterproofing is a technology that involves the development of crystals to help achieve water tight concrete structure that protects against sewage and industrial waste for use in waste water treatment applications [9].

Table 2:

Sr.No.	Materials	Amount (%)
1	Products given in Table 1	50.00
2	Gray Cement	50.20
3	Quartz sand	15.10
4	Alumina trihydrate	5.10
5	Hydrated lime	5.10
6	Fused silica	10.15
7	Calcite powder	6.10
8	Silicon coated matrix	1.00
9	Zinc stearate	1.00
10	Sodium gluconate	1.01
11	R.D powder	2.01
12	MHEC	1.02
13	Latex powder	3.02

Polymer deteriorate when exposed to weather.Theproperties of polymer such aesthetic , mechanical and electrical properties depend upon weather conditions such as daylight,heat , moisture and other climatic stress.Primary factors which affect polymers are solar radiation, temperature ,moisture atmospheric oxygen [10].

SOLAR RADIATION

Physical changes resulting from exposure to the environment are initiated by chemical bond breaking reactions caused by the absorbed light, either through direct or indirect processes. Chemical bond breaking is a prerequisite to any chemical reaction, a chemical reaction is a prerequisite to observable or measurable physical changes

TEMPERATURE

The destructive effects of light are usually accelerated at elevated temperatures as a result of the increased rate of secondary reactions, with reaction rates about doubling with each 10 degrees Celsius rise.

This may not be true for all materials but is often found with polymers[11].

MOISTURE

Moisture can take the form of humidity, dew, rain, snow, frost or hail, depending on the ambient temperature. Moisture in combination with solar radiation, contributes significantly to the weathering of many materials. This is due to both of the mechanical stresses imposed when moisture is absorbed or dissolved and to the chemical participation of moisture in the chemical evolution [12].

ATMOSPHERIC OXYGEN

Photo oxidation accounts for most polymer failures that occurred during outdoor exposure. It results from the effects of solar radiation in combination with oxygen. Oxygen can promote degradation in several ways [13].

CONCLUSIONS

The synthesized products functional test has been done in water proofing compounds and found that the prepared crystalline coating formulations were useful for integral waterproofing. A good weatherability and good stain resistance, wide tensile strength, quality cross linking, good pigment-binding capacity, a product with good gloss, found resistance to removal by detergents and good adhesion to common substrates was obtained.

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