(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
24 May 2018 (24.05.2018)

W!P O ¦ PCT

(10) International Publication Number
WO 2018/092158 Al

(51) International Patent Classification:
C09D 167/08 (2006.01) *C08J 3/00* (2006.01)

(21) International Application Number:
PCT/IN20 17/050542

(22) International Filing Date:
20 November 20 17 (20. 11.201 7)

(25) Filing Language: English

(26) Publication Langiuage: English

(30) Priority Data:
201621036107 2 1 November 201 6 (2 1.11.20 16) IN

(71) Applicant: **ASIAN PAINTS LTD.** [IN/IN]; 6A Shantinagar, Santacruz (E), Mumbai, Maharashtra 400 055 (IN).

(72) Inventors: **SHIVARKAR, Anandkumar B.;** Asian Paints R&T Centre TTC Industrial Area, Plot C-3B/1, Pawane Village, Behind Savita Chemicals, Thane - Belapur Road, Turbhe, Navi Mumbai, Maharashtra 400 703 (IN). **SHAH, Rajeshkumar M.;** Asian Paints R&T Centre TTC Industrial Area, Plot C-3B/1 , Pawane Village, Behind Savita Chemicals, Thane - Belapur Road, Turbhe, Navi Mumbai, Maharashtra 400 703 (IN). **JAIN, Rajeev K.;** Asian Paints R&T Centre TTC Industrial Area, Plot C-3B/1, Pawane Village, Behind Savita Chemicals, Thane - Belapur Road, Turbhe, Navi Mumbai, Maharashtra 400 703 (IN). **PARAB, Deep¬ak;** Asian Paints R&T Centre TTC Industrial Area, Plot C-3B/1 , Pawane Village, Behind Savita Chemicals, Thane - Belapur Road, Turbhe, Navi Mumbai, Maharashtra 400 703 (IN). **GOEL, Rajeev K ;** Asian Paints R&T Centre TTC Industrial Area, Plot C-3B/1, Pawane Village, Behind Savita Chemicals, Thane - Belapur Road, Turbhe, Navi Mumbai, Maharashtra 400 703 (IN). **MALLIK, B.P.;** Asian Paints R&T Centre TTC Industrial Area, Plot C-3B/1, Pawane Village, Behind Savita Chemicals, Thane - Belapur Road, Turbhe, Navi Mumbai, Maharashtra 400 703 (IN).

(74) Agent: **SEN, Anjan;** 17, Chakraberia Road South, Kolkata 700 025 (IN).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available):* AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available):* ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:
— *of inventorship (Rule 4.1 7(iv))*

Published:
— *with international search report (Art. 21(3))*

WO 2018/092158 A1

(54) Title: WATER BORNE ALKYD EMULSIONS FOR SURFACE PRIMER COMPOSITIONS FOR ARCHITECTURAL INTERIOR FINISHES

(57) Abstract: Aqueous alkyd emulsions are provided suitable for preparing water borne primer paint compositions for variety of porous and nonporous substrates and a process thereof consisting of i) preparation of high solid alkyd by reacting vegetable Oil fatty acids, aromatic carboxylic acid, aromatic dicarboxylic acid and polyol, and ii) preparation of aqueous emulsion of said high solid alkyd resin using suitable emulsifying agent (nonionic and anionic surfactant) through emulsion inversion process (EIP). The aqueous primer paint compositions comprising of alkyd emulsions, inorganic pigments, extenders, additives and driers are suitable for highly porous and chalky Plaster of Paris and cementitious surfaces which are quite difficult to coat with. Such water borne primer compositions provided an adherent coating having excellent adhesion/ inter coat adhesion with the substrate as well as between layers of primer and top coats.

TITLE: WATER BORNE ALKYD EMULSIONS FOR SURFACE PRIMER COMPOSITIONS FOR ARCHITECTURAL INTERIOR FINISHES

FIELD OF THE INVENTION

The present invention provides a low volatile organic compound (VOC) content (< 30 gm/ Litre) alkyd emulsions involving selective high solid alkyds (95-100% solids) obtained of condensation of vegetable oil fatty acids (iodine value of 120-180 gl_2/100g), polyhydric alcohols, polybasic acids and monobasic acids, adapted for further emulsification using nonionic and reactive anionic surfactant (polymerizable surfactant) through EIP technique to obtain stable aqueous alkyd emulsion. Such alkyd emulsions have 50-60% solids and particle size of less than 1 micron. The alkyd emulsion of the present invention as a primer paint composition attained excellent adhesion properties on variety of porous and nonporous substrates and specifically on highly porous and chalky POP and cementitious substrates wherein conventionally available water borne binders such as acrylic latexes, alkyd-acrylic dispersion and polyurethane dispersions (PUD) based primer paint compositions showed poor adhesion properties.

Advantageously, alkyd emulsion prepared from low molecular weight, high solid alkyd prepared from fatty acid of iodine value of > 120 gl_2/100g using reactive surfactant improved the paint film properties such as drying, sealing, penetration ability, chalk binding ability, adhesion as well as coatability with matt/ satin/ sheen top coats on variety of the architectural interior substrates as stated above. Paint compositions based on such aqueous alkyd emulsions would also find application for other porous and chalky cementitious surfaces such as lime putty, cement putty, acrylic wall putty, handmade putty (putty mixed with about 4-10% raw linseed oil/ air drying enamel paint) in architectural interior finishing and provides superior adhesion, flow/ levelling and hiding.

BACKGROUND ART

Plaster of Paris (POP) is extensively used in architectural and decorative finishes to give smooth and rich appearance to walls, stones, wood and false ceilings. POP

is available as white to pale yellow dry powder and it is the mixture of gypsum, dolomite, bassanite, quartz etc. Water is added to the POP powder to make a paste of desired consistency and applied on surfaces in thick coats and then sanded to give a smooth surface. This POP surface is highly porous, chalky, and hydrophilic in nature and also POP from different suppliers is different in quality and composition. Because of these characteristics, POP surface after painting, exhibits many problems such as patchiness in the film, poor film adhesion, brushing marks and efflorescent effects etc. Presently aqueous paint prepared from water borne acrylic emulsions i.e. acrylic latexes are used for the priming of POP surfaces. However, these acrylic latexes based paints showed poor adhesion on POP surfaces and are derived from non-renewable petroleum or natural feed stock. For superior adhesion and sealing of chalky and porous surfaces, solvent borne alkyd primer paints have been used. Alkyd resins are derived from vegetable or animal oils/fatty acids in combination with polybasic acids and polyols. It has renewable contents and there is possibility of designing alkyd recipes with very high bio-renewables. However, solvent borne alkyds contain 20-60% organic solvents (e.g. mineral turpentine, xylene, etc.) for dilution and which remain the major concern with respect to health and safety especially for interior painting application. Therefore, there is a need to either eliminate or minimize the use of organic solvents and design waterborne (WB) alkyds with very low VOC.

Waterborne alkyd dispersions/ emulsions are known in the art and are commercially available but no specific information is available about the low VOC aqueous alkyd emulsions meant for Primers for porous and nonporous substrates and specifically for highly porous and chalky POP and cementitious substrates wherein conventionally available water borne binders showed poor adhesion.

US. Pat. No. 3,442,835 solely describes preparation of water dispersible alkyd by incorporation of polyethylene glycol (PEG) into the alkyd resin back bone and neutralization of acid groups to obtain water soluble alkyd dispersion.

US. Pat.No. 6,780,910, which describes an alkyd emulsion prepared by an emulsion inversion process (EIP) that includes forming an alkyd resin,

neutralizing residual acid groups, adding surfactant and water so that an "oil in Water" emulsion is formed. The alkyd dispersions thus formed are described as being useful in wood stains and common architectural paints.

US. Pat. No. 6,787,599 discloses two-component water paint system comprising aqueous alkyd emulsion. This prior patent describes reacting a hydroxy-functional alkyd emulsion with a water-dispersible polyisocyanate in a two component coating formulation, wherein the alkyd resin can be obtained from an oleic or fatty acid component, a polyvalent alcohol, a polyether polyol having a molecular Weight of 400 to 8,000, a monobasic carboxylic acid and a polycarboxylic acid or the anhydride.

US. Pat. No. 3,223,658 describes mainly the preparation of water based alkyd resin by external emulsification process using water soluble and oil soluble nonionic surfactants and resulting products.

US. Pat. No. 3,306,866 & 3,440,193 disclose the preparation of stable aqueous emulsion of styreneated alkyd resin and alkyd resin by external emulsification process using only nonionic surfactants of hydrophile/ lipophile balance (HLB) value in range of 13-17.

US. Pat. No. 3,979,346 describes the preparation of aqueous dispersion of alkyd resin comprising ammonia, polyoxyethylene nonionic surfactant containing two or more radicals of unsaturated fatty acid/ fatty alcohol with an iodine number between 130 and 200, together with anionic surfactant containing carboxylic acid groups prepared from drying oil and maleic anhydride, which is hydrolyzed in the process.

US. Pat. No. 4,069,178 describes the process for the preparation of water soluble silicon modified alkyd by neutralizing the residual carboxylic groups and coating based on this dispersion have improved weather and water resistance.

WO. Pat. No. 01/92378 describe mainly process for the preparation of aqueous emulsion of alkyd resin by external emulsification technique using combination

of nonionic and anionic surfactants and neutralizing agent if necessary at high speed of 2000 rpm.

US. Pat. No. 2007/0167603 describes the process for the preparation of water soluble alkyd using adduct of C1-C4 alkoxy polyethylene glycol and cycloaliphatic dicarboxylic acid anhydride. Also process for the preparation of aqueous alkyd emulsion using water soluble alkyd as emulsifier and use thereof for textile, mineral materials, metal and wood coating.

EP patent No. 2444436 describes process of preparation of aqueous emulsion of urethane modified alkyd using nonionic and anionic surfactants.

EP patent No. 220281 describes aqueous paint composition comprising alkyd emulsion (acrylic-alkyd/ styrene-acrylic alkyd), opaque polymer (organic extender), one or more pigments to provide high gloss decorative and protective coatings for various substrates.

US. Pat. No. 2008/0188588 describes traffic paint composition comprising high solid aqueous emulsion of alkyd resin derived from natural oil and nonionic & anionic surfactants and pigments which may meet the federal standards for traffic paint as set forth in Federal specification TT-P-1952B.

US. Pat. No. 2009/0004468 describes primer formulation for composite building materials comprising acrylic latex polymer of glass transition temperature about 50-70 ºC to improve adhesion and act as weather-guard and a hydrophobic treatment to all surfaces of the composite building materials upon application.

WO. Pat. No. 2014/146049 describes the preparation of reactive polyoxyalkylene emulsifiers from styrenated phenols and allyl glycidyl ether and making of alkyd emulsions using these emulsifiers. Metal top coat coating composition comprising said aqueous alkyd emulsion improves drying, hardness and water resistance of coating.

US 20140272156 discloses an aqueous alkyd resin coating composition, comprising (a) at least one alkyd resin as a dispersed phase; (b) an emulsifier based on styrenated phenols that have been converted into reactive surfactants

by first reaction with one or more equivalents of an allylglycidyl ether to provide pendant allyl groups and then oxyalkylated and (c) water. Such reactive surfactants are chemically distinct as unsaturation are contributed by allyl groups unlike the unsaturation from the fatty alcohol chain.

It is thus apparent from the aforesaid prior arts that paint compositions comprising waterborne alkyd emulsions have not been designed for variety of porous and nonporous substrates and specifically for highly porous POP, cementitious and puttied substrates. It is also noteworthy that conventionally available water borne polymers like acrylic latex, alkyd acrylic dispersions and polyurethane dispersion based paints showed poor adhesion on POP and similar kind of highly porous cementitious substrates.

Therefore, there was a need to designsingle component air drying, low VOC aqueous alkyd emulsions for primer cum sealer application over porous and nonporous substrates which can provide excellent adhesion and enhance the durability of the architectural painting system.

OBJECTS OF THE INVENTION

The basic object of the present invention is to synthesize a low VOC aqueous alkyd emulsion based on air-drying, long oil high solid alkyd meant for water borne Primer Paint composition for application over variety of porous and nonporous substrates and specifically for highly porous POP, cementitious and puttied substrates.

It is another object of the present invention to provide for said aqueous alkyd emulsion and a process of synthesis thereof.

It is another object of the present invention to provide for said single component air-drying long oil, high solid alkyd and a process for synthesis thereof.

It is yet another object of present invention to provide for said primer cum sealer paint composition involving said aqueous alkyd emulsion which imparts excellent

adhesion on variety of porous and nonporous substrate as well as inter coat adhesion between primer and water borne acrylic emulsion based top coats.

It is yet another object of the present invention to use water soluble drier comprising Iron (Fe) complex which improves drying and hardness of primer paint composition as well as provides no/ negligible shade discoloration in the WB top coat paint.

It is yet another object of the present invention to provide for said aqueous alkyd emulsions and water borne primer coating compositions thereof that would have low VOC, low odor, free from hazard of flammability and solvent toxicity, easy to handle and clean up after use.

It is still another object of the present invention to provide for said water borne primer paint compositions comprising said aqueous alkyd emulsions for applications as primer cum sealer for excellent adhesion on variety of porous and nonporous substrates such as POP, cementitious, metal and other plastering/ leveling inorganic materials such as lime putty, cement putty, acrylic wall putty, handmade putty etc. for architectural interior finishes.

SUMMARY OF THE INVENTION

According to the basic aspect of the present invention there is provided an aqueous alkyd resin emulsions comprising air-drying, long oil high solid alkyds and surfactant system involving a non-ionic surfactant and reactive anionic surfactant and having low volatile organic compound (VOC) Content of < 30 gm / litre and solids content of 45- 60% suitable for architectural interior water borne primer cum sealer Paint compositions.

Preferably an aqueous alkyd resin emulsions is provided wherein said long oil high solid alkyds is a reaction product of uniquely customized vegetable oil fatty acids (up to $C_{16} \leq 7$; $C_{18}:0 \leq 3$; $C_{18}:1$ 27; $C_{18}:2$ 39; $C_{18}:3$ 23; $C_{20} \leq 0.5$) having iodine value of 120-180 gI_2/100g and preferably 140-155 gI_2/100g, aromatic dicarboxylic acid/ acid anhydride, aromatic carboxylic acid and

polyhydric alcohol favouring desired performance and economy to the water borne primer cum sealer coating compositions.

More preferably in said aqueous alkyd resin emulsions said long oil alkyds include characteristics of acid value <5mg KOH/g, oil length of 60-80 %, a number average molecular weight ranging from 2000-4500, and non-volatile content of 95-100%.

According to another preferred aspect of the present invention there is provided an aqueous alkyd resin emulsions wherein said surfactant system comprises nonionic surfactant and reactive anionic surfactant integrated with the alkyd polymer backbone.

Preferably in said aqueous alkyd resin emulsions said surfactant system comprises nonionic surfactant including polymeric di-block copolymer of polyethylene oxide and a polypropylene oxide and reactive anionic surfactant comprising phosphate ester of fatty alcohol ethoxylate including unsaturation in fatty alcohol chain adapted for promoting auto-oxidative curing at said unsaturation points in presence of metallic driers to be integrated with the alkyd polymer backbone.

Advantageously said aqueous alkyd resin emulsions are stable for upto 2 years and has particle sizes in the range of 0.4-0.9 micron.

It is thus the primary finding of the present invention that water borne primer paint compositions comprising low VOC, air-drying, aqueous alkyd emulsions provide excellent adhesion and peel failure of a topcoat when applied to the highly porous and chalky POP and similar substrate and works well for nonporous substrates as well. Such aqueous alkyd emulsions are prepared from air-drying, long oil, high solid alkyd which is obtained from selectively customized vegetable oil fatty acid (CVOFA), aromatic dicarboxylic acid, aromatic carboxylic acid and

polyol. This low molecular weight, thermosetting, high solid alkyd imparts better substrate wetting and penetration as compared to thermoplastic polymers such as acrylic latexes, alkyd-acrylic dispersion and polyurethane dispersions etc. After drying, this low Tg alkyd polymer film becomes high Tg polymer film due to formation of oxidative crosslinked network which imparts hardness and excellent adhesion.

It was thus surprisingly found that the aqueous alkyd emulsion of the present invention involving the special selective high solid alkyd together with reactive emulsifying surfactant further improves film adhesion wherein said reactive emulsifying surfactant including phosphate ester of fatty alcohol ethoxylate including unsaturation in fatty alcohol chain can co-cure with the special alkyd polymer of the present invention at said unsaturation points in presence of metallic driers to be integrated with the alkyd polymer backbone and thus becomes a part of the coating.

Hence, it cannot be migrated on surface or extracted by water which avoids the pitting, degradation and loss of adhesion of the coating.

Since the surfactant reacts on application leading to loss of its original character as emulsifier which in turn results in enhanced water resistance performance of the aqueous alkyd resin emulsion based coating comprising of metallic driers.

Advantageously, the aqueous alkyd resin emulsion is also stable for upto 2 years involving a particle size in the range of 0.4-0.9micron which could not be achieved with other reactive surfactants.

Apart from Maxemul 6112 (phosphate ester of fatty alcohol ethoxylate) which imparts the desired advantageous aspects of the present invention, few more reactive anionic surfactants such as SIPOMER COPS-1™ (allyloxy hydroxypropyl sulphonate), SIPOMER COPS-3™ (ally ether phosphate, ammonium salt) from Solvay and Adeka Reasope SR-20 (anionic surfactants of ether sulphate) from M/S Adeka, Japan were investigated which resulted into unstable alkyd emulsion and larger particle size.

According to another aspect of the present invention there is provided a process for manufacturing aqueous alkyd resin emulsions comprising the steps

providing said long oil high solid alkyd resin and emulsifying with a surfactant system involving a non-ionic surfactant and reactive anionic surfactant to thereby provide for said alkyd emulsions having low volatile organic compound (VOC) Content of < 30 gm / Litre and solids content of 45-60% suitable for architectural interior water borne primer cum sealer paint compositions.

Preferably in said process for manufacturing aqueous alkyd resin emulsions the same comprises the steps:

providing long oil high solid alkyd resin in about 50% by weight of the emulsion emulsifying at about 50-80°C at 250-500 rpm through intermig stirrer by involving a combination of 1: 1 ratio of non-ionic and reactive anionic surfactants in about 5-12 % by weight based on said alkyd,

neutralizing the emulsion thus obtained with a neutralizing agent of about 0.05-5% weight based on emulsion and water to yield aqueous alkyd resin emulsions therefrom .

More preferably , a process for manufacturing aqueous alkyd resin emulsions is provided wherein said neutralizing agent is selected from inorganic/organic bases such as potassium hydroxide, Ammonia (25%) soln, amino methyl propanol (AMP-95), di-methyl ethanolamine (DMEA), tri-ethyl amine (TEA) or like compounds.

According to another aspect of the present invention there is provided a high solid long oil alkyd resins having acid value <5 mg KOH/g, oil length of 60-80 %, a number average molecular weight ranging from 2000-4500, and non-volatile content of 95-100%.

Preferably said high solid long oil alkyd resins is provided which is a reaction product of vegetable oil fatty acids having iodine value of 120-180 g I_2/100g involving high unsaturation fatty acids including linoleic and linolenic fatty acids, polyhydric alcohols, dicarboxylic acid, chain terminating carboxylic acid.

According to another preferred aspect a process for the manufacture of high solid long oil alkyd resin the same is obtained of reacting 55-65 wt% vegetable oil fatty acids having iodine value of 120-180 g I_2/100g, 12-20 wt% polyhydric alcohols, 12-30 wt% dicarboxylic acid, 0-5% chain terminating carboxylic acid and mixed xylene as azeotropic solvent by heating to about 170°C-240°C until an acid number of < 5 mg KOH/g is attained.

According to another aspect of the present invention there is provided a water borne primer cum sealer paint compositions comprising

aqueous alkyd resin emulsions as claimed in anyone of claims 1 to 6, for application over variety of porous and nonporous substrates and specifically for highly porous POP, cementitious and puttied substrates and favouring excellent adhesion on said variety of porous and nonporous substrate as well as inter coat adhesion between primer and water borne acrylic emulsion based top coats.

Preferably a water born primer coating compositions is provided comprising said aqueous alkyd resin emulsions that is low VOC, low odor, free from hazards of flammability and solvent toxicity resulting in ease of store, handle and suitable for use as architectural interior finishes.

More preferably a water borne primer cum sealer paint compositions is provided comprising water soluble drier including Iron (Fe) complex imparting desired drying, hardness and excellent adhesion on variety of porous and nonporous substrates with good inter coat adhesion between primer and topcoat free of shade discolouration.

In accordance with the aspect of the present invention, aqueous alkyd emulsions prepared by the process comprisesof :

1) a step of forming a low molecular weight, high solid alkyd (95-100% solid) by condensation reaction of fatty acids of drying / semi drying oils, aromatic dicarboxylic acid, mono functional carboxylic acid and polyol.
2) a step of forming aqueous alkyd emulsion by EIP technique using combination of nonionic surfactant and reactive anionic surfactant and neutralizing agent.

According to another aspect of the present invention, aqueous alkyd emulsions have been designed which are suitable for primer cum sealer coating compositionsconsisting of pigments, fillers, thickeners, additives, biocides, in can preservatives and water borne driers.

In another aspect of the present invention, water borne drier types and their composition is uniquely formulated for the primer paint composition to impart good drying, intercoat adhesion while having no impact on the color/ shade appearance of the coating system comprising of alkyd emulsion based primer and acrylic latex based top coat.

Typically such coating compositions can be designed and applied to achieve dry film thickness (DFT) of 10-20μιη in 1 coat for priming /sealing of variety of porous and nonporous substrates such as POP, cementitious, metal and other plastering/ levelling cement putties using brush/ roller as application equipment.

DETAILED DESCRIPTION OF THE INVENTION

As discussed hereinbefore, the present invention provides preparation of aqueous alkyd emulsions for low VOC primer cum sealer paint compositions which impart excellent adhesion and prevent peel failure of topcoat when applied to the variety of porous and nonporous substrates such as POP, cementitious, metal and other plastering/ leveling putties.

Advantageously, low molecular weight, high solid alkyd is prepared from selectively customized vegetable oil fatty acid composition (iodine value of 140-155 g I_2/100g), aromatic dicarboxylic acid, aromatic carboxylic acid and polyol for making aqueous alkyd emulsion which imparted excellent substrate wetting and penetration and Tg of the film increased during the curing of the coating through auto oxidative cross-linking reaction resulting in the desired good drying, hardness and adhesion of the film.

Most advantageously, use of reactive emulsifying surfactant for preparation of aqueous alkyd emulsion further improved film adhesion. Reactive surfactant contain unsaturated fatty acid/fatty alcohol promoting reaction at unsaturation point and it becoming integral part of the alkyd polymer backbonepost auto-oxidative curing in presence of metallic driers. This prevents migration of the surfactant to the surface reducing water sensitivity to the film compared to the conventional surfactants. This further enhances the hardness and adhesion properties of the paint.

In an embodiment of the present invention the process steps comprises of the following:

In step 1, air-drying, low molecular weight, high solid alkyd (95-100% solid) was prepared by condensation reaction of fatty acids of drying / semi drying oils, aromatic dicarboxylic acid, aromatic carboxylic acid and polyol which providedexcellent substrate wetting/ penetration and adhesion.

In step 2, the said air-drying high solid alkyd was externally emulsified by EIP technique using combination of nonionic surfactant and reactive anionic surfactant and neutralizing agent to obtain very low VOC (<30 g/lit.) aqueous alkyd emulsion. After curing, reactive surfactant becomes integral part of alkyd polymer network and does not migrate to the film surface which improved the film properties such as hardness, adhesion and reduced water sensitivity.

Water borne primer paint compositions were prepared using said aqueous alkyd emulsion, pigments, fillers, thickeners, additives, biocides, in can preservatives, water borne driers and water etc. Such primer paints has very low VOC (<20 g/lit.) content and when applied at DFT of 15-35 μιη provided excellent adhesion on porous and non porous substrates as well as inter coat adhesion between primer and water borne top coats. Whereas primer compositions based onconventionally used acrylic latexes and other waterborne polymers exhibited poor adhesion on highly porous and chalky substrateslike Plaster of Paris which is a distinctive feature and special finding of the present invention.

Plaster of Paris is widely used in decorative finishes to give smooth and rich appearance to walls, stones, wood and false ceilings. POP surface is highly porous, chalky, and hydrophilic in nature and due to these characteristics, POP surface after painting, exhibits many problems such as patchiness in the film, poor film adhesion, brush marks and efflorescent effects. Primer compositions for such architectural finishes are required to be designed to integrate with the substrate and tolerate above mentioned problems.

The present invention relates to air drying single component water borne paint compositions for providing good adhesion on POP surface in decorative architectural interior finishes as well as have broad utility for priming of different surfaces such as metal and different cement putties etc. The water borne Primer paint compositions mentioned here essentially comprise of aqueous alkyd emulsion, pigments, fillers, thickeners, additives, biocides, in can preservatives, water borne driers and water etc especially designed for architectural interior finishes.

One of the principle aspects of the present invention relates to the development of water borne polymeric binder system for primer paint compositions comprising of aqueous alkyd emulsion with water borne metallic driers. Aqueous alkyd emulsion composition according to the invention is prepared in two steps as follows:

In the first step of forming the alkyd resin of the present invention, vegetable oil fatty acid, an aromatic/cycloaliphatic carboxylic acid, aromatic dicarboxylic acid or anhydride are reacted with an excess of polyol. In order to achieve air drying and better flow and levelling properties, long and medium oil alkyd formulations are preferred. Moreover, long oil alkyd provides additional advantage of lower viscosity at high solids as compared to short / medium oil alkyd. Alkyd Oil length was varied from 50-80% and acid value was kept < 10 mg KOH/g with hydroxyl value of 20-50 mg KOH/g. The viscosity of the resin at 95-97% solid on Gardner Viscometer at 25° C was observed at Y-Z7 and preferably Z1-Z4.

Vegetable oil fatty acids suitable for use in the present invention include mixture of aliphatic saturated / unsaturated fatty acids such as palmitic, steraric, oleic, linoleic and linolenic acid. However amount of saturated fatty acids is kept to as low as possible to facilitate maximum unsaturation in alkyd chain leading to auto-oxidative cross-linking in presence of metallic driers. Preferred fatty acids include, but are not limited to, soybean oil fatty acid (SOFA), dehydrated castor oil fatty acid (DCOFA), tung oil fatty acid,linoleic acid, tall oil fatty acid (TOFA), and linseed oil fatty acid (LOFA) etc. Fatty acids having high unsaturation i.e. iodine value of 130-180 gI_2/100g are particularly preferred. The amount of vegetable oil fatty acid used is generally from 50-70% by weight, preferably 55-65% based on total ingredients. Selectively customized vegetable oil fatty acid (approximate fatty acid composition %: up to $C_{16} \leq 7$; $C_{18}:0 \leq 3$; $C_{18}:1$ 27; $C_{18}:2$ 39; $C_{18}:3$ 23; $C20 \leq 0.5$) having iodine value of 140-155 gI_2/100g is preferred for the present invention. However, soybean oil fatty acid, linseed oil fatty acid or dehydrated castor oil fatty acid, cotton seed oil fatty acid, Niger seed oil fatty acid, tobacco seed oil fatty acid, rubber seed oil fatty acid or any other drying / semi drying oil fatty acids may also be used. Suitable aromatic dicarboxylic acids or anhydrides thereof include isophthalic acid (IPA), terephthalic acid (TPA), phthalic anhydride (PAN) or other aromatic or cycloliphatic acid anhydride aloneor in combination, but the preferred one is isophthalic acid. The amount of aromatic dicarboxylic acid can vary from 10-20% of total ingredients, preferably 12-16% based on total ingredients. Suitable monofunctional carboxylic acids such as benzoic acid, abietic acid (Rosin), cyclohexane carboxylic acid may be used as chain terminator, but preferred one is benzoic acid. The amount of aromatic carboxylic acid can vary from 0-7% of total ingredients, preferably 0-5% based on total ingredients.

Isophthalic acid is preferably used as dibasic acid for alkyd synthesis apart from phthalic anhydride. In the present invention, isophthalic acid has been preferred over other carboxylic acids/ anhydrides in order to make the alkyd resin for better hardness, superior film property and enhanced thermal and hydrolytic stability of the resin.

The polyols suitable for the practice of this invention include polyhydric alcohols having two or more hydroxyl groups per molecule. There are many polyols known in the art, or mixtures thereof, such as trimethylpentanediol (TMPD), diethylene glycol (DEG), neopentylglycol (NPG), glycerol, pentaerythritol (PE), trimethylolethane (TME), trimethylol propane (TMP) and the like. In this invention, pentaerythritol is used as polyol in amount of 10-25%, preferably 12-20% based on total ingredients.

In the first step, high solid alkyd resins are prepared by charging the vegetable oil fatty acid, pentaerythritol, isophthalic acid, benzoic acid, and mixed xylene as azeotropic solvent into a reaction vessel. Reaction vessel is equipped with a temperature controller, heating mantle, nitrogen purger, overhead stirrer and Dean Stark assembly. The reaction charge is heated at 170°C for 1 h and thereafter reaction temperature is increased from 170 to 240 °C in 5-8 h until an acid number < 10mgKOH/g is obtained. The mixture is cooled to room temperature.

In the second step, aqueous alkyd emulsions are prepared i.e. stable oil in water emulsion by EIP technique using combination of nonionic surfactant, anionic surfactant and neutralizing agent.

Accordingly, the present invention provides aqueous emulsions of alkyd resin comprising of emulsifiers having at least one nonionic surfactant. The term nonionic surfactant used in the present invention refers to branched, mixture of branched, linear alcohol alkoxylates, ethylene oxide (EO)/propylene oxide (PO) copolymers of alkylphenols, fatty alcohols, fatty acids, fatty amines and fatty amides etc. Although emulsification can be achieved using nonionic surfactants on their own, effective and stable emulsion is obtained when they are used in combination with anionic surfactants such asphosphate esters, ether carboxylates, alkyl ether sulphate, alkyl aryl sulphonates or mixtures of these types of anionic surfactants.

In the present invention, particularly proprietary surfactants from M/S Croda such as polymeric nonionic surfactant (high molecular weight, nonionic polymeric di-bloc copolymer essentially consisting of a polyethylene oxide and a polypropylene oxide) and polymeric anionic surfactant are used in combination. However, preferentially combination of proprietary surfactants from M/S Croda such as polymeric nonionic surfactant (Maxemul 7101/7401) and reactive anionic surfactant (Maxemul 6112, Phosphate ester of Fatty alcohol ethoxylate) are used. The weight ratio of nonionic surfactant to anionic surfactant is usually from 90:10 to 10:90, desirably 70:30 to 30:70, and particularly 50:50 has been employed in the present invention.

Neutralizing agents suitable for use in the practice of this invention include inorganic/organic bases such as potassium hydroxide, Ammonia (25%) soln, amino methyl propanol (AMP-95), di-methyl ethanolamine (DMEA), tri-ethyl amine (TEA) etc. Preferred neutralizing agent for the present invention is DMEA. Amount of neutralizing agent typically varies from 0.05 to 5% by weight of the emulsion. The amount of neutralizing agent is used to neutralize the free acidity of alkyd resin which affect the HLB of the resin and hence compatibility with the emulsifier. Although, in practice, the amount of neutralizing agent used will normally be sufficient to achieve pH within a desired range in the product emulsion. Desirably the product emulsion will typically have a pH of 3-9 and preferably 5-8.5.

In the present invention, aqueous alkyd emulsions typically contain 40- 60%, more usually 45- 55% and particularly about 50% by weight of the emulsified alkyd.

The total amount of surfactants i.e. nonionic and anionic used as emulsifiers in this invention typically varies from 3-15% and about 5-12% preferred by weight based on emulsified alkyd resin. In general, alkyd emulsions of larger average particle size are obtained with lower amounts of emulsifier. However, excess amount of emulsifiers leads to inferior drying and water resistance of the film.

Aqueous alkyd resin emulsions were made by the EIP method in a stainless steel vessel using an IKA RW 20.n mixer equipped with an intermig stirrer at a rotational speed of 250-500 rpm. Alkyd resin, surfactants and neutralizing agent were charged into the emulsion vessel. The mixture was slowly heated to 50-60°C and into this mass preheated water of 60-80° C was added gradually under stirring. Temperature during emulsification process is maintained at 50-80°C. Initially a water in oil (alkyd) emulsion is formed and the viscosity of this emulsion increases as more water is added up to a maximum at or near the inversion point. With the addition of more water, the emulsion will reach a point where inversion occurs to form an oil (alkyd) in water emulsion. After inversion, the viscosity usually falls and further remaining water is added relatively quickly. Then emulsion is cooled to ambient temperature (25-35° C) and filtered. Prepared aqueous alkyd emulsions are characterized by % solid, viscosity , particle size and pH.

Particle size of aqueous alkyd emulsion was measured using a Malvern Zetasizer 4 (covering the size range of 50 nm to 1) and the particle size reported as cumulative Z-average (Z-av) in nm. The aqueous alkyd emulsions of the invention have an average particle size in the range of 0.1 μιη -1μιη and frequently in the range of 0.25 μιη - 0.75 μητι. Viscosity of the emulsion was measured using a brookfield (model KU-2) viscometer at 25° C.

In the present invention, water soluble metallic driers are employed to accelerate the conversion of coating into cross-linked dry film through auto oxidative polymerization. Some of the preferred drier combinations employed in context with the present invention are Octa-Soligen® 421 aqua (Co: 2.4 %, Zn: 2.57 % and Zr: 5.85 %), ADDITOL® VXW 6206 (Co: 5 %, Li: 0.22 % and Zr: 7.5 %), Borchi® OXY- Coat 1101 (Fe complex) and Borchi® OXY - Coat 1301 (Fe complex). Iron (Fe) complex based water soluble direr is preferably used as it provided no/negligible shade discoloration of the Acrylic latex based top coat as compared to Cobalt (Co) based drier.

The aqueous alkyd emulsions of the invention are used to make waterborne paints by mixing with at least one separately prepared pigment dispersion. This is very well known method by those skilled in the art-often called "letdown"-typically carried out under gentle agitation. The success of the letdown step depends on achieving an intimate intermingling of these two disparate particle systems to yield a stable and uniform overall particle suspension (the alkyd-based paint) and the emulsions of this invention can be effectively used in such systems.

The invention further includes a waterborne primer paint composition which comprises of aqueous alkyd emulsion as mentioned above. The optimum performance of such paint composition can be achieved by incorporating other ingredients such as pigments, fillers, thickeners, additives, biocides, in can preservatives, water borne driers and water.

Pigment volume concentration (PVC) of aforesaid primer compositions may vary from 10-70% and preferably 20-55%. However PVC of such compositions will largely depend on type of pigments and extenders selected in addition to their oil absorption value and nature of alkyd emulsion used.

A water borne primer formulation described herein, may be applied by methods known in the art, including brushing, spraying, dabbing, and rolling etc. The primer formulation was applied on POP and similar type of cementitious surfaces at a thickness of 15-35 μιη and preferably at 20-30 μιη. The relative thickness of such coating would largely depend on the material and its use. However the thickness may be achieved in a single coat or by additional consecutive coats. After application of the primer formulation to the desired thickness, paint film is cured by auto oxidative cross-linking. In general, oxidative crosslinking of an alkyd resin is affected by ambient temperature and humidity/ moisture present in the environment/ substrate. The primer paints prepared with unique composition of aforesaid aqueous alkyd emulsions form the dry film even with moisture level up to 25% present in the POP substrate.

In order to study adhesion performance, substrate to be coated is either suitably prepared with a putty or coated directly with the said aqueous alkyd emulsion based Primer compositions. In addition to the nonporous substrates, elaborate performance testingof the said water borne primer compositionswere carried out on difficult to adhere highly porous POP & cementitious substrates as per general process being described herein.

Cementitious substrate was prepared by plastering it with POP. For this, POP powder grades i.e. Gyproc(M/S Saint Gobain), Marvel loplast (M/S Asian Paints Ltd) and Gypsum Stucco Plaster (M/S Diamond) were used by mixing with appropriate quantity of water and applied on the wall with steel trowels/ steel float and finished to a smooth surface. It was ensured that POP applied substrate is smooth, true to plane and free from slopes or curves and undulation. After drying the surface was sanded with Emery paper to give smooth appearance. After preparation of POP surface, one coat of said primer composition of the invention comprising aqueous alkyd emulsion and subsequently two coats of the commercially available WB acrylic latex topcoats were applied. Application of each layer (1coat primer and 2coats topcoat) was followed by drying at ambient temperature for 4-8 h. Then painted surface was allowed to cure for 7 days.

As further described herein, adhesion of the coating was tested using 1 inch wide 'Adhesive Tape' of 3M Ltd ® and cross cut (X cut) adhesion was tested using 2 inch cellophane tape as per ASTM D 3359. On a coating air dried for 7 days at ambient temperature, adhesive tape was applied and pressed uniformly with the thumb to remove air gap, if any. Then tape was removed at right angle and any removal of the coating from the substrate or sticking on the tape was recorded as adhesion failure. A primer as described herein provides excellent film adhesion on POP surface having moisture content as high as 25 %.

In another embodiment of the present invention, water borne primer as described herein provided good intercoat adhesion between primer and acrylic latex based topcoat .

In still another embodiment, the water borne primer paint as mentioned herein when applied to chalky and porous composite building materials like acrylic wall putty , patra putty, cement putty etc., it provided good adhesion between these composite materials and Paint.

The following examples illustrate certain embodiments and aspects of the present invention and not to be construed as limiting the scope thereof. All parts and percentages are by weight basis unless otherwise stated.

EXAMPLES

Preparation of High Solid Alkyd Resins

High solid alkyd resins were synthesized in a standard 2 Litre 4-neck round type glass reactor. Reactor was fitted with a temperature controller, heating mantle, N_2 purger, overhead stirrer and water removing condenser (Dean stark). Into the reactor, vegetable oil fatty acid, isophthalic acid, benzoic acid, pentaerythritol , di-butyl tin oxide (catalyst) and mix xylene (azeotropic solvent) were added. Reaction mass was heated to 170°C for 1 h and thereafter reaction temperature increased from 170 to 240°C in 5-8 h until an acid value of < 10 mg KOH/g is obtained. The mixture was cooled to room temperature. By using this process, variety of high solid alkyd resins for the preparation of aqueous alkyd emulsions of present inventions were designed as listed in Table 1. The description and characteristic data of these alkyd resins are given in Table 2.

Table 1: High solid alkyd compositions

Example No.	A1	A2	A3	A4	A5	A6
Fatty acid used	SOFA	DCOFA	LOFA	CVOFA	LOFA	CVOFA
Fatty acid (%)	64.6	64.6	64.6	64.6	63	63
Isophthalic acid (%)	13.2	13.2	13.2	13.2	15.7	15.7
Benzoic acid (%)	1.5	1.5	1.5	1.5	1.3	1.3
Pentaerythritol (%)	16.2	16.2	16.2	16.2	15.5	15.5
DBTO (%)	0.03	0.03	0.03	0.03	0.03	0.03
Mix. Xylene (%)	4.47	4.47	4.47	4.47	4.47	4.47
Total	100	100	100	100	100	100

Table 2. Physical properties of High Solid Alkyds:

Example No.	A1	A2	A3	A4	A5	A6
% solid (120 ºC/1h)	95.4	95.3	96.1	96.3	95.2	95.5
Acid Value, (mg KOH/g)	4.8	2.1	1.3	1.5	4.2	4.7
Viscosity @ 25ºC on Gardner scale	Z6-Z7	Z5-Z6	Y-Z	Z-Z1	Z4-Z5	Z3-Z4

It was found that the high solid alkyds not in accordance with the present invention could not provide for the desired characteristics of the primer paint compositions intended by way of the present invention.

Preparation of aqueous alkyd emulsions:

The alkyd resins from the aforesaid examples A1 to A6, nonionic and anionic surfactants and neutralizing agent were charged into the jacketed emulsion

vessel and heated to 50-80° C.Thereafter, preheated water of 50-80°C was added gradually over the period of 30-60 min. into reaction mass under stirring using intermig agitator at 250-500 rpm. Initially a water in oil emulsion is formed and as the water addition reaches to about 60-70% of the total quantity, the emulsion reaches to a point where inversions occurs to form an oil in water emulsion. Then emulsion is cooled to ambient temperature and filtered. By using this process, aqueous alkyd resin emulsions of present inventions were prepared using different alkyd resins from example A1-A6 and are listed in Table 3. The description and characteristic data of these alkyd emulsions are given in Table 4.

Table 3: Aqueous alkyd emulsion compositions:

Example No.	E1	E2	E3	E4	E5
Alkyd resin	48 (A1)	48 (A2)	48 (A3)	48 (A4)	48 (A3)
Nonionic surfactant	1.5	1.5	1.5	1.5	1.5
Anionic surfactant (Non-reactive)	1.5	1.5	1.5	1.5	0
Anionic surfactant (Reactive)	0	0	0	0	1.75
Neutralizing agent	0.25	0.1	0.09	0.08	0.55
Demineralized Water	48.75	48.9	48.91	48.92	48.2
Total	100	100	100	100	100

Table 3: Continued

Example No.	E6	E7	E8	E9	E10
Alkyd resin	48 (A4)	48 (A5)	48 (A6)	48 (A5)	48 (A6)
Nonionic surfactant	1.5	1.5	1.5	1.5	1.5
Anionic surfactant (Non-reactive)	0	1.5	1.5	0	0

Anionic surfactant (Reactive)	1.75	0	0	1.75	1.75
Neutralizing agent	0.55	0.238	0.24	0.71	0.71
Demineralized water	48.2	48.76	48.76	48.04	48.04
Total	100	100	100	100	100

E1, E2, E3, E4, E7 and E8 free from Anionic Reactive Surfactant though shows no significant difference in physical properties but the performance significantly changes upon inclusion of the same in the below examples.

Table 4: Physical properties of the alkyd emulsions

Aqueous alkyd resin emulsion	E1	E2	E3	E4	E5
%Solid(120°C/1 h)	50.5	51.2	50.2	50.7	51.8
Average particle size (µm)	0.195	0.210	0.780	0.230	0.96
Viscosity on stormer (g); 25°C	68	74	72	75	84
pH	6.8	6.6	6.9	6.7	7.9
VOC (g/lit)	25.8	26	20	19	24

5

Table 4: Continued

Aqueous alkyd resin emulsion	E6	E7	E8	E9	E10
%Solid (120ºC/1h)	52	51.1	50.9	52.6	52.1
Average particle size (µm)	0.5	0.86	0.7	1.1	0.67
Viscosity on stormer (g); 25°C	81	73	74	86	83

pH	8.1	6.3	6.1	8.2	8.5
VOC (g/ lit)	23	25	24.5	27	29

Primer paint compositions

Primer paint compositions comprise of aqueous alkyd emulsion, pigments, fillers, thickeners, additives, biocides, in can preservatives, water borne driers and water. The pigment volume concentration (PVC) ranges from 20-70% and preferably 30-55% .Primer paint formulation is given in Table 5. Different primer paints were prepared using aqueous alkyd emulsions from examples (E1-E10). In addition to that Primer compositions were also prepared using water borne polymers of other chemical configurations such as Acrylic latexes i.e. Primal UC-R64M (Dow) and Pliotec SA-40 (Omnova solutions), polyurethane dispersion i.e. Bayhydrol UH-260 (Bayer/ Covestro) and Alkyd acrylic dispersion Resydrol 6150 (Ex Allnex). These primer paints were applied on POP surfaces at a thickness of 15-35 μιη by brushing or rolling application and allowed to dry at room temperature for 4-8h. After drying of primer paints, two coats of the commercially available water borne acrylic latex topcoat Paint was applied. The painted surfaces were allowed to cure for seven days and evaluated for various paint performance properties like, finish, shade discoloration and adhesion. Test results are shown in Tables 6a/ 6b/ 6c.

Table 5: Preparation of primer paint

Component	Example	Acceptable range(wt %)
Water	Demineralized water	15-40
Pigment	TiO_2	5-15
Extender	Clay, marble powder	10-40
Thickener	Cellulosics	0.05-1.0
Surfactant	Nonionic, anionic	0.5-3
Biocide	Troy PI30	0.05-1.0
In can preservative	Rocima 623	0.05-1.0

Binder	Aqueous alkyd resin emulsion/ Acrylic Latex/ polyurethane dispersion (PUD)	20-70

Table 6a: Test results

Primer paint compositions comprising Alkyd emulsion	Examples				
	E1	E2	E3	E4	E5
Film dry time (h)	6	4	5.5	6	5
Finish	Smooth	Smooth	Smooth	Smooth	Smooth
Shade Discoloration	No	No	Yes	No	Yes
Tape adhesion, (% Paint film removal)	Fail (90-100)	Ordinary (15-30)	Good (5-15)	Ordinary (15-30)	Excellent (0-5)
Cross cut adhesion (% Paint film removal)	Fail (90-100)	Fail (80-100)	Ordinary (15-30)	Ordinary (15-30)	Excellent (0-5)

Table 6b: Continued

Primer paint compositions with Alkyd emulsion from	Examples				
	E6	E7	E8	E9	E10
Film dry time (h)	6	5	6	4	5
Finish	Smooth	Smooth	Smooth	Smooth	Smooth
Shade Discoloration	No	Yes	No	Yes	No
Tape adhesion, (% Paint film removal)	Excellent (0-5)	Ordinary (15-30)	Ordinary (15-30)	Good (5-15)	Good (5-15)
Cross cut adhesion (% Paint film	Excellent (0-5)	Ordinary (20-30)	Ordinary (15-30)	Good (5-15)	Good (5-15)

removal)	

Table 6c: Test result (comparative examples)

Primer paint compositions with Acrylic latex/ PUD	Examples			
	Primal UC-R64M	Pliotec SA-40	Resydrol 6150	Bayhydrol UH 260
Film dry time (h)	0.5-1	0.5-1	1-1.5	0.5-1
Finish	Smooth	Smooth	Smooth	Smooth
Shade Discoloration	No	No	No	No
Tape adhesion, (% Paint film removal)	Fail (90-100)	Fail (80-100)	Fail (60-90)	Fail (70-90)
Cross cut adhesion (% Paint film removal)	Fail (90-100)	Fail (90-100)	Fail (80-100)	Fail (80-100)

It is thus possible by way of the present advancement to provide low VOC, air drying aqueous alkyd emulsion which was prepared from selectively customized vegetable oil fatty acid based high solid alkyd using reactive surfactant. Water borne primer paint composition comprising said alkyd emulsion provides superior adhesion (ASTM D 3359) on POP surface and similar type of cementitious surfaces compare to water borne acrylic latex and PUD. Designing of air-drying, low molecular weight high solid alkyd from selectively customized vegetable oil fatty acid was significantly special for making alkyd emulsions of the present invention adapted for superior adhesion, inter coat adhesion and less shade fading compare to other vegetable oil fatty acids (e.g. SOFA, DCOFA, LOFA) based high solid alkyds. SOFA and DCOFA based alkyd emulsions showed no shade fading but adhesion was inferior whereas LOFA based alkyd emulsion showed good adhesion but showed very high level of shade fading in top coat. Process of making of alkyd emulsion from said high solid alkyd using selective reactive surfactant surprisingly significantly improved the hardness and film adhesion as compared to non-reactive surfactant and other reactive surfactants.

We Claim :

1. Aqueous alkyd resin emulsions comprising air-drying, long oil high solid alkyds and surfactant system involving a non-ionic surfactant and reactive anionic surfactant and having low volatile organic compound (VOC) Content of < 30 gm / litre and solids content of 45-60% suitable for architectural interior water borne primer cum sealer Paint compositions.

2. Aqueous alkyd resin emulsions as claimed in claim 1 wherein said long oil high solid alkyds is a reaction product of uniquely customized vegetable oil fatty acids (up to C16 ≤ 7; C18:0 ≤ 3; C18:1 27; C18:2 39; C18:3 23; C20 ≤ 0.5) having iodine value of 120-180 gI_2/100g and preferably 140-155 gI_2/100g, aromatic dicarboxylic acid/acid anhydride, aromatic carboxylic acid and polyhydric alcohol favouring desired performance and economy to the water borne primer cum sealer coating compositions.

3. Aqueous alkyd resin emulsions as claimed in anyone of claims 1 or 2 wherein said long oil alkyds include characteristics of acid value <5mg KOH/g, oil length of 60-80 %, a number average molecular weight ranging from 2000-4500, and non-volatile content of 95-100%.

4. Aqueous alkyd resin emulsions as claimed in anyone of claims 1-3 wherein said surfactant system comprises nonionic surfactant and reactive anionic surfactant integrated with the alkyd polymer backbone.

5. Aqueous alkyd resin emulsions as claimed in anyone of claims 1-4 wherein said surfactant system comprises nonionic surfactant including polymeric di-bloc copolymer of polyethylene oxide and a polypropylene oxide and reactive anionic surfactant comprising phosphate ester of fatty alcohol ethoxylate including unsaturation in fatty alcohol chain adapted for promoting auto-oxidative curing at

said unsaturation points in presence of metallic driers to be integrated with the alkyd polymer backbone.

6. Aqueous alkyd resin emulsions as claimed in anyone of claims 1-5 that is stable for upto 2 years and has particle sizes in the range of 0.4-0.9 micron.

7. A process for manufacturing aqueous alkyd resin emulsions as claimed in anyone of claims 1-6 comprising the steps

providing said long oil high solid alkyd resinand emulsifying with a surfactant system involving a non-ionic surfactant and reactive anionic surfactant to thereby provide for said alkyd emulsions having low volatile organic compound (VOC) Content of < 30 gm / Litre and solids content of 45-60% suitable for architectural interior water borne primer cum sealer paint compositions.

8. A process for manufacturing aqueous alkyd resin emulsions as claimed in claim 7 comprising the steps:

providing long oil high solid alkyd resin in about 50% by weight of the emulsion emulsifying at about 50-80°C at 250-500 rpm through intermig stirrer by involving a combination of 1: 1 ratio of non-ionic and reactive anionic surfactants in about 5-12 % by weight based on said alkyd,

neutralizing the emulsion thus obtained with a neutralizing agent of about 0.05-5% weight based on emulsion and water to yield aqueous alkyd resin emulsions therefrom.

9. A process for manufacturing aqueous alkyd resin emulsions as claimed in anyone of claims 7 or 8 wherein said neutralizing agent is selected from inorganic/organic bases such as potassium hydroxide, Ammonia (25%) soln, amino methyl propanol (AMP-95), di-methyl ethanolamine (DMEA), tri-ethyl amine (TEA) or like compounds.

10. High solid long oil alkyd resins having acid value < 5 mg KOH/g, oil length of 60-80 %, a number average molecular weight ranging from 2000-4500, and non-volatile content of 95-100%.

11. High solid long oil alkyd resins as claimed in claim 10 which is a reaction product of vegetable oil fatty acids having iodine value of 120-180 g I_2/100g involving high unsaturation fatty acids including linoleic and linolenic fatty acids, polyhydric alcohols, dicarboxylic acid, chain terminating carboxylic acid.

12. A process for the manufacture of high solid long oil alkyd resin as claimed in anyone of claims 10 or 11 obtained of reacting 55-65 wt% vegetable oil fatty acids having iodine value of 120-180 g I_2/100g, 12-20 wt% polyhydric alcohols, 12-30 wt% dicarboxylic acid, 0-5% chain terminating carboxylic acid and mixed xylene as azeotropic solvent by heating to about 170°C-240° C until an acid number of < 5 mg KOH/g is attained.

13. Water borne primer cum sealer paint compositions comprising aqueous alkyd resin emulsions as claimed in anyone of claims 1 to 6, for application over variety of porous and nonporous substrates and specifically for highly porous POP, cementitious and puttied substrates and favouring excellent adhesion on said variety of porous and nonporous substrate as well as inter coat adhesion between primer and water borne acrylic emulsion based top coats.

14. Water born primer coating compositions as claimed in claim 13 comprising said aqueous alkyd resin emulsions that is low VOC, low odor, free from hazards of flammability and solvent toxicity resulting in ease of store, handle and suitable for use asarchitectural interior finishes.

15. Water borne primer cum sealer paint compositions as claimed in anyone of claims 13 or 14 comprising water soluble drier including Iron (Fe) complex imparting desired drying, hardness and excellent adhesion on variety of porous and nonporous substrates with good inter coat adhesion between primer and topcoat free of shade discolouration.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IN2017/050542

A. CLASSIFICATION OF SUBJECT MATTER
C09D167/08, C08J3/00 Version=2018.01

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum **documentation** searched **(classification** system followed by classification symbols)

C09D, C08J

Documentation searched other than minimum **documentation** to the extent that such documents are included in the fields searched

Electronic data base consulted during **the international search** (name of data base and, where practicable, search terms used)

Patseer, IPO Internal Database

C. DOCUMENTS **CONSIDERED** TO BE RELEVANT

Category*	Citation **of document, with** indication, where appropriate, of **the** relevant passages	Relevant to claim No.
X	WO2011053904 (Al) DOW GLOBAL TECHNOLOGIES LLC 05-05-2011(05 May 2011) Whole Document	1-15
A	WO2016111718 (Al) RHODIA OPERATIONS 14-07-2016 (14 July 2016) Paragraph [0166]	1-15
A	EP0248192A2 (A2) FORMBYS INC (US) 09-12-1987 (09 December 1987) Example 5	1-15
A	TW324736B TIKKURILA CPS OY (FI) 11-01-1998 (11 January 1998) Abstract	1-15

☐ **Further documents are listed in** the **continuation of** Box **C.**

☒ **See patent family** annex.

* Special categories **of** cited **documents:**

"A" **document** defining **the general** state **of the** art **which is not** considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is **cited** to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
08-02-2018	08-02-2018

Name and mailing address of !he ISA/	Authorized officer
Indian Patent Office Plot No. 32, Sector 14,Dwarka, New Delhi-110075 Facsimile No.	Ramesh Vanaparthi Telephone No. +91-1125300200

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IN2017/050542

Citation	Pub. Date	Family	Pub. Date
WO 2011053904 Al	05-05-2011	CN 102686638 B	01-04-2015
		US 8709607 B2	29-04-2014
Wo 2016111718 Al	14-07-2016	CN 107207739 A	26-09-2017
		EP 3242907 Al	15-11-2017
		US 2017355806 Al	14-12-2017
EP 0248192 A2	09-12-1987	BR 8702028 A	09-02-1988
		JP S6322870 A	30-01-1988
TW 324736 B	11-01-1998	WO 9708255 Al	06-03-1997
		US 5985987 A	16-11-1999
		EP 0846149 Bl	03-11-1999