
Preparation and Properties of Wax Emulsions, Wax Dispersion and Their Applications in Coatings

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Abstract

Polish has been used before wax coating for the protection of surfaces which lost their shine because of oxidation. Also polish provides hardness and gloss to the coated layer. The factors which affect coatings are formulation, viscosity, opacity, lubrication and durability. Waxes for cars generally include carnauba wax, beeswax, polyethylene wax, paraffin and microcrystalline waxes. The waxes and emulsion waxes are found to be UV inhibitors to protect paint in the exposure of sun light. Waxes with scents that are pleasant to humans may turn out to be repulsive for mosquitoes so candle scents is a natural and affordable way popular in households to drive mosquitoes away. Here we also reported formulation of cold cream which clean and provides softness the skin is a w/o type emulsion. A semi solid jelly which is used in cosmetic skin care and shoe polish also formulated and their properties are also evaluated.

Keywords: Cosmetics, Wax, Emulsions, Polish, Antioxidants

1. Introduction:

In recent times, wax and wax emulsions have been extensively used due to their versatile properties. Waxes occur naturally or are synthetic compounds made from high fatty acid esters (typically C36-C50) or from polymers (700 < molecular weight <10,000). For a compound to be regarded as wax it should possess the following properties:

- i) It should be solid at 20 °C, varying in consistency from soft and plastic to brittle and hard.
- ii) It should have a melting point of at least 40 °C without decomposing.
- iii) It should exhibit low viscosity at temperature slightly above melting point and non-stringing above its melting point.

Waxes being less expensive and more reliable have a significant impact on several formulations than other surface conditioner additives [1]. Even if used in very small quantities < 5% waxes impart and improve various properties such as slip and lubrication, abrasion

resistance, water repellency, anti blocking, matting and other critical properties in paints, leather, polishes, textiles, coating and ink areas.

Classification of commonly used waxes in industrial applications is given in Table 1:

Table 1

NATURAL	SEMI-SYNTHETIC	SYNTHETIC
Beeswax	Paraffin	PP (polypropylene)
Carnauba	Microcrystalline	PE(polyethylene)
Jojoba	Montan	PTFE (polytetrafluroethylene)
Candelilla		Polyamide
		Fischer-Tropsch

Wax emulsions are liquids and are incorporated in water-based formulations to improve the surface properties. The wax emulsions are now well established due to their vast technical applications in several industries worldwide [2]. Their very fine particle size ensures a homogenous and intimate incorporation within other ingredients of formulations by simple mixing thus maximizing the required effect Formulation of wax emulsion depends on the particle size and are classified as:

Wax emulsions which normally have particle size $<1\mu\text{m}$ and thus has a minimized effect on the coating gloss, mainly used in OPV printing inks and for paint coatings. Wax dispersions either water or solvent based have a particle size typically $>1-2\mu\text{m}$ is generally applicable to solvent-based coating and water-based construction chemicals.

2. Applications of Paraffin Wax:

Paraffin waxes are derived from crude oil and are categorized by oil content and degree of refinement [3]. It can be blended with other types of waxes to give variety of different products for different applications. It can be used in paints, paper coating ,construction chemicals ,wood coatings and other industrial uses. Cosmetically paraffin wax acts as a natural emollient and helps to make the skin look soft and smooth by removing the dead cells. Paraffin wax bath treatment is an effective remedy to improve blood flow, relax muscles and decrease joint stiffness. Paraffin wax treatment followed by active exercises results in significant improvement of range of motion. It acts as a form of heat therapy to minimize muscle spasms ,inflammation and helps in relieving pain of people with osteoarthritis, rheumatoid arthritis and other joint mobility issues [4].

3. Application of Waxes in Cosmetics:

An emulsifier helps to create a blend of water and oil which are normally immiscible. The emulsifying wax is created when a wax material (either vegetable wax or petroleum-based wax) is mixed with a detergent (a cleanser that dissolves in water) such as sodium dodecyl sulfate or polysorbates to make oil and water bind together in a smooth emulsion. The emulsifier can either be oil in water (o/w) or water in oil (w/o) and is used as a binding agent to mix the two and make creams, lotions, moisturizers, toners and other fluid cosmetics which contain oil and water. Natural or synthetic emulsifiers like cetearylolivate (from natural olive fruit or olive oil), PEG (polyethylene glycol), PPG (polypropylene glycol) can be opted for use in cosmetics.

4. Application of Montan Wax:

Montan wax is a natural wax obtained from lignites which contain pure wax (50-80 %), resin (20-40 %) and bitumen (10-20%) [5]. The Montan wax is an ideal substitute for expensive carnauba wax and is widely used in chemical industry, wax polish industry, carbon paper industry, electrical and machinery industry. Montan wax emulsion can be used for different purposes depending upon application. It gives excellent shine on the product and is more advantageous than montan wax as it is simple to apply, easy to store and transport, no fire hazard, and no heating expenses.

5. Application of Carnauba Wax:

Carnauba wax has various uses in food, cosmetics, automobile and furniture wax, molds for semiconductor devices and as coating for dental floss. Carnauba wax has very good emulsification properties and oil binding properties for mineral oils and ester oils. It is used as a hardener for printing inks and as a polish for candies and medicinal tablets. It raises the melting point of gels, has emollient and hypoallergenic properties and is a preferred additive to thicken lipstick, lip balm, mascara, foundations and other skin care preparations. Carnauba wax is too brittle but when combined with other waxes especially beeswax gives a high gloss water proof finish in many leather products and increases the durability and hardness of leather.

6. Application of Waxes for Fruit Coating:

All fruits and vegetables are covered naturally in a cuticle that is a barrier to moisture loss. However, some water vapour can move through the pores, cuticle and micro cracks in the cuticle. Natural wax is first removed by washing followed by wax coating of a biological and petroleum derived wax. The wax coating blocks the pores of cuticle and significantly reduces the loss of water vapour. The coating process can be carried out by either dipping, brushing or spraying with wax to give a better shine and a longer shelf life of fruits and vegetables [6].

7. Formulation of Car Polish Using Beeswax:

Car polish helps to eliminate scratches, swirls, dirt and often minor imperfections by removing a fine layer of the paint work so the appearance of scratches is minimized. Car polish should be used before wax to restore auto paint that has lost its shine due to oxidation. Waxes are used in car polish to provide hardness and gloss to the film, control formulation viscosity, improve opacity and provide lubrication and durability. Car wax forms a protective layer which keeps the car looking new, shiny and enhances car's paint coating. Commonly used waxes for cars include carnauba wax, beeswax, polyethylenewax, paraffin and microcrystalline waxes. Some of these waxes have UV inhibitors to protect cars paint from fading in the sun.

1. Mineral Turpentine Oil 400 ml
2. Olive Oil 400 ml
3. Beeswax 200 grams

Heat the above ingredients to make a solution. Allow it to cool for 30 minutes. Store it in a suitable bottle.

8. Formulation of Mosquito Repellant Candle:

Scents that are pleasant to humans may turn out to be repulsive for mosquitos so candle scents is a natural and affordable way popular in households to drive mosquitoes away.

Citronella is one of the most widely used oil that repels insects by masking scents that are attractive to insects. It is also effective in blocking all the olfactory senses of mosquitoes. Eucalyptus acts as an insect repellent as it has antiviral, antibacterial, antifungal and antimalarial properties.

1. Eucalyptus oil 50 gram
2. Camphor 20 gram
3. Stearic acid 30 gram
4. Bees wax 530 gram
5. Citronella oil 30 gram
6. Waxelene colour 1.2 gram

Putted the boiler on oven with beeswax and stearic acid. Stired it with a steel spoon to dissolve both properly below 70°C. Added others ingredients one by one and stir well till the mixture forms an emulsion. Transfer the hot liquid emulsion into a candle dice with cotton yarn and then putted the dice in normal water till it cools down to normal temperature. opened the candle dice and finally it was ready to pack.

9. Formulation of Lipsticks Using Wax:

Emulsifiers, emollients, binders and colorants contribute to the properties of a fine lipstick. Waxes enable the mixture to be formed into easily recognized shape of cosmetic. Fragrance and colour are added as antioxidants and preservatives to prevent lipstick from being rancid.

1. Carnauba Wax 25 gram
2. White Petroleum 30 gram
3. Bees Wax 40 gram
4. Liquid Paraffin 5 gram
5. Color As per requirement
6. Perfume. As per requirement

Put the boiler on an oven with Carnauba Wax, Bees Wax, Liquid Paraffin and White Petroleum jelly. Stir it well with a spoon to dissolve at 60°C . Then add color, perfume and transfer the hot mixture into the dice and wait till it cools down to normal temperature.

10. Formulation of Cold Cream Using Wax:

Cold creams used to clean and soften the skin is a w/o type emulsion in which borax and wax are added as emulsifying agents

1. Paraffin Liquid 570 gram
2. White Wax 160 gram
3. Lanolin 50 gram
4. Borax 8 gram
5. Water 200 gram
6. Geraniol 8 gram
7. Phenyl ethyl alcohol 4 gram

In a steam jacket machine or a double boiler heat white wax, paraffin liquid and lanolin at 80°C. In another container dissolve borax and water and heat at 80°C. Now slowly add this aqueous phase to the mineral oil wax heated oily phase. Cool it to normal temperature and add other ingredients. Transfer it to a suitable container.

11. Formulation of Petroleum Jelly:

Petroleum jelly is a mixture of mineral oils and waxes which forms a semi solid jelly like substance and is used widely in cosmetic skin care.

1. Mineral oil 300 ml
2. Emulsifying Wax 30 gram
3. Paraffin 20 gram
4. Tea tree oil 3 ml

Dissolve paraffin and emulsifying wax at 70°C. Then add mineral oil and tea tree oil into this wax mixture. Stir it well and cool down to normal temperature. Pack it in a suitable container.

12. Formulation of Floor Polish Using Wax:

Floor polish provide shine to the floor and makes the micro scratches less visible. It provides slip control and abrasion resistance.

1. Carnauba wax 25 gram
2. Bees Wax 8 gram
3. Paraffin Wax 10 gram
4. Montane wax 6 gram
5. Emulsifier 5 gram
6. Turpentine oil 150 gram

All the waxes are melted and then oleic acid is added. The temperature of the mixture is maintained at 80 to 90°C. After that emulsifier and borax are added to boiling water and this is finally added to the wax mixture. Allow it to cool. Now our Floor polish is ready.

13. Formulation of Eyebrow Pencil Using Wax:

1. Beeswax 150 grams
2. Stearic acid 100 grams
3. Triethanolamine 25 grams
4. Burnt umber 25 grams
5. Lanolin anhydrous 13 grams

Heat beeswax, stearic acid and lanolin in an oven at 80°C till all the ingredients mix properly. Now add burnt umber and Triethanolamine with stirring. Allow it to cool down and transfer the mixture into the pencil dice.

14. Formulation of Matt Top:

Matting lacquer is used to give mat effect on leather, synthetic leather, leather board, wood, wood board, synthetic wood and on stone surface also.

Container A:

- | | |
|-------------------------------|-----------|
| 1. Mineral Turpentine Oil | 100 grams |
| 2. Toluene | 139 grams |
| 3. Isobutyl Acetate | 79 grams |
| 4. Polyethylene Wax (PE 520) | 34 grams |

Container B :

- | | |
|----------------------|---------------|
| 1. Toluene | 205.50 grams |
| 2. n-Butyl Alcohol | 128.500 grams |
| 3. Iso butyl Acetate | 179.850 grams |
| 4. Dibutyl Phthalate | 59.600 grams |
| 5. NC 30/40 sec | 74.500 grams |

Heat the ingredients of container A at 78-80°C. Slowly add the contents of Container B to Container A with continuous stirring. Allow it to cool and pack it in suitable container for use.

15. Conclusion:

Some of the commonly used wax applications are discussed while others are yet to be explored by improved extraction and purification processes. Wax emulsions have broad applications at various levels and can be formulated to give the required properties. The key driver for wax and wax emulsion market is the increasing demand for paints, coatings, adhesive and sealant industry. Due to high demand the developing countries of Asia Pacific such as India, China, Japan and others are the largest segment for wax emulsion market.

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