

Manicure Preparations

Nail lacquers form the largest group of manicure preparations. They should be easy to apply, dry and harden rapidly, be waterproof, well adherent, glossy, elastic, and resistant to chipping and abrasion. The raw materials should be non-toxic and dermatologically innocuous.

The main characteristics of a good nail lacquer are that:

- 1) It should have property viscosity and good wetting and flow properties for even filming.
- 2) It should have uniform colour (which requires finely divided pigments, intimately grounded and wetted by the solvent).
- 3) It should be glossy on application.
- 4) It should have good adhesion on nails.
- 5) It should have sufficient flexibility so that it does not become brittle (does not crack).
- 6) It should have sufficient hard surface which is resistant to impact and scratch.
- 7) It have reasonable drying time (1-2 min) without developing bloom.

- 8) It should maintain the above properties for a reasonable period of around one week.
- 9) It should be non-toxic and dermatologically safe.
- 10) It should form a satisfactory film on nails.
- 11) It should be stable on storage.

Ingredients: The essential ingredients of nail enamels are: film formers, resins, plasticizers, solvents, pigments, etc.

Film formers: These include cellulose acetate, cellulose acetate butyrate, ethyl alcohol, vinyl polymers and various polymers of methacrylate. Nitrocellulose, derived from cellulose, is used as the film-forming agent. These are three readily available grades of nitrocellulose. Nail enamel generally uses the grade with nitrogen content of 11.8-12.2 which is soluble in esters, ketones and glycol ethers. Viscosity varies with the degree of polymerisation of nitrocellulose. The lower the viscosity the more brittle the resultant film. However, films produced by nitrocellulose are hard, water proof and also resist abrasion. When nitrocellulose is used alone, it shows poor gloss, shrinkage and moderate adhesion. If nitrocellulose becomes unstable, it may cause severe discoloration of nails of user.

2) Resins:

It imparts adhesion and improve gloss, helps in dispersion of insoluble pigments and lakes. Natural resins: Shellac, Benzoin, Gum dammar, Sandarac, ester gums.

Synthetic resins: Sulphonamide-formaldehyde resins (Polyvinyl Sulphonamide).

Commercial Resins: Santolite MHP has been claimed to increase the hardness of nitrocellulose and imparts gloss to it.

Santolite MS 80% has ^{also} been claimed to increase moisture resistance. Other resins compatible with nitrocellulose are Malic Alkyl resins, acrylates, vinyls, formaldehyde and polyamide resins.

Plasticizers: They impart flexibility and adhesiveness to the film and also effect viscosity and the volatility or rate of drying.

There are two types of plasticizers

a) Solvent Plasticizers: Act as solvents and are high molecular weight, high boiling point and low volatility for example Butyl Acetyl Ricinolate.

b) Non-Solvent Plasticizers: Act as softners for example, castor oil.

They are not compatible with nitrocellulose. These can not used alone because after evaporation of solvent, they often form droplets on the film (castor oil). The percentage usage varies from 25-50% in various formulations. The major group of plasticizers contributes of phthalates (eg dibutyl phthalate), phosphates, phthalyl glycolates, Sulphonamide citrates (acetyl trimethyl citrate). Glycolate plasticizers give better hardness to film, better feel and good adhesion on the nail.

Solvents

Solvents are volatile organic liquids that combine all the ingredients of lacquer formulation and make a homogeneous viscous preparation. They impart brushability and for regulating the drying time and viscosity of preparation. High boiling point solvents - give brighter film whereas low-boiling point solvents impart lower viscosity and have better covering power.

Solvents can be Categorised into three types:-

- a) Active Solvents: True Solvents for example, Esters, Ketones and glycol ethers for nitrocellulose.
- b) Couplers: Not solvents but in conjugation increase the strength of other solvents.
- c) Diluents: The diluents are organic solvents that are miscible with nitrocellulose solvents but are not themselves solvents for nitrocellulose. They are used to stabilize viscosity, to carry resins in solution and to reduce the effect of subsequent applications on the coats of enamel already applied and to lower the overall cost of the product. For example Aromatic and aliphatic hydrocarbons like Toluene, Benzene, Xylene, Hexane, Heptane, Napthalene, light petroleum ether and alcohols.

Pigments
The coloring of nail enamel must possess the following properties:

- (a) It should be non-toxic and non-irritating.
- (b) It should not produce stain on the nails or skin.
- (c) It should be substantially insoluble in lacquers.
- (d) It should be compatible with other ingredients of the nail enamel.
- (e) It should be moderately stable when exposed to light.
- (f) It should impart to the clear lacquer an acceptable shade for cosmetic use.

All coloring materials used must be certified by the FDA. The major inorganic pigments used in nail enamel are titanium dioxide, yellow iron oxide, red iron oxide, iron blue, iron black, chrome oxide green, etc. However, iron oxides and chrome greens have tendency to settle. Recently, the use of hydrophobic pigments in nail lacquers has reduced settling problems by deagglomerating the heavier pigments suspended in the lacquer. The total amount of colorant in nail enamel usually is 3-5%.

Suspending Agents

The rheological goal of the nail polish formulation is to develop a thixotropic system in which viscosity decreases with increasing shear rate. A thixotropic system becomes liquid upon agitation and reforms as a gel structure when at rest. Modified clays are the most commonly used suspending agents for nail polish. These clays (such as stearalkonium hectorite and stearalkonium bentonite) increase the viscosity to a

greater extent and the heavy oxides remain suspended. Their concentration ranges from 0.5-2.0%. Addition of inorganic or organic acids like orthophosphoric acid further activates the swelling of the clay and enhancing its viscosity, thereby increasing its thixotropy.

Opacifying agents

These are whitening agents which help to develop shades which will reflect the same colour on the nails as they are in the bottle. For example Titanium dioxide, Zinc oxide.

UV Absorbers

These are used to prevent deterioration of ingredients due to UV light. For example Benzophenone and its derivatives.

Perfume

Perfume is not necessary in nail enamel but add to its finer qualities. It is mainly used to counteract the unpleasant odor of the solvents used. About 1% is the proper quantity to use. It should also be remembered that it should be miscible with the ingredients and should not discolor and dull the shades of the finished enamel.

Method of Preparation

Add 75% of the solvent and whole of the diluent in a mixer. Mix well with agitation. Nitrocellulose is then added with stirrer on. After this plasticizer is added followed by resin. Mixing is continued for several hours until solution of all ingredients is complete and uniform. Clear lacquer is then formed. Pigmented chips or concentrated tints can be added and mixing is continued further to give nail lacquer product.

Formula - 1

S.No	Ingredients	% (N/W)
1.	n-Butyl acetate	28.23
2.	Toluene	24.54
3.	Nitrocellulose	12.00
4.	Ethyl Acetate	11.00
5.	Toluene Sulfonamide / formaldehyde resin	10.00
6.	Acrylate Copolymer	0.5
7.	Di-butyl phthalate	5.0
8.	Isopropyl Alcohol	4.25
9.	Steral potassium hexoxide	1.0
10.	Campher	1.5
11.	Titanium dioxide	.75
12.	Iron oxide	.15
13.	DLG Red no-6 Barium lake	0.08

Nail Polish Remover

Nail polish removers/nail cleaners are defined as the mixture of solvents containing small amounts of fat intended to remove nail enamel.

The ideal characteristics of nail polish remover are as under

1. It should not be too volatile to evaporate during application
2. It should be non-irritating to the surrounding skin
3. It should ^{not} leave the nails sticky
4. It should not have strong degreasing effect to leave the nails brittle
5. It should not have an unpleasant and obtrusive odor.

Formula-1-2

S.No	Ingredients	% (W/W)	% (W/W)
1.	Ethyl Acetate	98.0	40.0
2.	n-Butyl Acetate	-	40.0
3.	Castor oil	2.0	2.0
4.	Ethyl Cellulose	-	2.0
5.	Stearic acid	-	11.0
6.	Ammonium hydroxide	-	3.0
7.	Colour	Qs	Qs
8.	Perfume	Qs	Qs

Artificial Flavours

Flavours is a term for an ingredient or a combination of materials used to impart a flavour or a taste to cosmetics and personal care products. These are used in a wide variety of products to enhance the taste of cosmetics and personal care products. Flavours are typically included only in products which may be subjected to ingestion, such as lipsticks or oral hygiene products. Many ingredients that function as fragrance components can also be used as flavouring compounds.

A "flavourant" is defined as a substance that gives another substance flavour altering the characteristics of the solute, causing it to become sweet, sour, tangy etc. A flavour is a quality of something which affects the sense of taste. Phthalates are a group of chemicals used in hundreds of products, such as toys, vinyl flooring and wall coverings, detergents, lubricating oils, food packaging, pharmaceuticals, blood bags and tubing and personal care products such as Nail polish, Hair sprays, aftershave lotions, soaps, shampoos, Perfume and other fragrance preparations.

Primary phthalates used in cosmetic products have been Di-butyl-phthalate (DBP), used as a plasticizer in products such as Nail polishes (to reduce cracking by making them less brittle); (DMP) Dimethyl-phthalate used in hair sprays (to help avoid stiffness by allowing them to form a flexible hair on film on the hair); and Diethyl Phthalate (DEP) used as a solvent and fixative in fragrances.

Natural flavouring substances:- These flavouring substances are obtained from plant or animal raw materials, by physical, microbiological or enzymatic processes. They can be either used in their natural state or processed for human consumption, but cannot contain any natural-identical or artificial substances.

Natural-identical flavouring substance:- These are obtained by synthesis or isolated through chemical processes, which are chemically and organoleptically identical to flavouring substances naturally present in products intended for human consumption. They can not contain any artificial flavouring substances.

Artificial flavouring Substances:- These are not identified in a natural product intended for human consumption, whether or not the product is processed. These are typically produced by fractional distillation and additional chemical manipulation of naturally sourced chemicals, crude oil or coal tar. Although they are chemically different, in sensory characteristics they are the same as natural ones.

Description of various flavours

S.No	Flavour	Chemical
1.	Buttery	Diacetyl, Acetyl propenyl, Acetoin
2.	Banana	Isobutyl Acetate
3.	Bitter Almonds	Benzaldehyde
4.	Cinnamon	Cinnamaldehyde
5.	Apple	Manzanate
6.	Fruity	Ethyl Propionate
7.	Grapes	Methyl Anthranilate
8.	Orange	Limonene
9.	Pear	Ethyl Decadienoate
10.	Pineapple	Allyl Hexanoate
11.	Vanilla	Ethyl Vanillin
12.	Winter Green	Methyl Salicylate