How to Make Hair Conditioners

As hair conditioners mean many things to many people, there is no universally valid definition of the term 'conditioner' available. Most cosmetics manufacturer, however, agree that one or more of the following modes of action are characteristic for a hair conditioning product:

Properties of Hair Conditioners

- Improved wet combing
- Improved dry combing
- Reduced of fly-away hair (antistatic)
- Increased gloss & shine
- Increased volume & body
- Improvment of curl retention
- Repair of hair shaft
- Improved moisturization

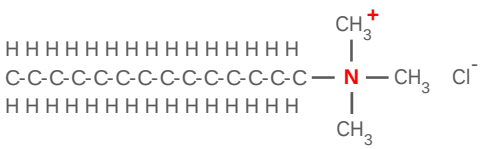
While there are a large variety of conditioning products on the market including shampoos, rinses, creams, balsams, and hair masks, the most common physical form for a conditioner is a thick, opaque, creamy liquid. - The basic raw materials needed to make such a "standard" conditioner are as follows:

Ingredients for Hair Conditioners

- Cationic Surfactants
- Cationic Polymers
- Bodying Agents & Thickeners
- Emollients
- Auxiliary Emulsifiers
- Fragrances
- Preservatives

Cationic Surfactants

The most common principle of active ingredients in hair conditioners are quaternary ammonium compounds (= quats). Quaternary means that the ammonium (N) has 4 chemical groups attached. Quats can be thought of as ammonium salts with hydrogen molecules replaced by alkyl groups. The anion is usually chloride. A typical quat, for example, is cetyl trimethyl ammonium chloride:



A quat's ability to condition comes from the hydrophobic (water-repelling) nature of the long C-H-tail and the positive (cationic) charge of the N-group which is attracted to the negatively (anionic) charged proteins of the hair. This electrostatic interaction, coupled with the fatty nature of long C-H-tail, inhibits rinse-off and makes the hair cuticle smooth, soft and lubricious. As a result, the hair can be combed much easier and fly-away is largely reduced due to the neutralization of the static electrical build up.

The fatty chains (C-H-tails) are derived from various oily components as coconut oil, castor oil, canolla oil or others. The longer the fatty chain the more lubricant is the quat. Hence, for dry and damaged hair quats with long or multiple fatty chains are preferred (e.g. behentrimonium or propyltrimonium).

Drawbacks of quats include the rather low water solubility and the poor compatibility with anionic surfactants which are commonly used as cleansing agents in shampoos. Making 2-in-1 shampoos may thus lead to stability problems. These difficulties, however, can be overcome by adding a non-ionic co-surfactant (e.g. coco betaine) or a non-ionic emulsifier (e.g. polysorbate-80 or ceteareth-20) which can assist greatly in the stability and solubility of quats.

In summary, quats are the most important active ingredients in hair conditioners, so that a conditioner without a quat may not be considered a conditioner.

Cationic Polymers

Cationic polymers are another important group of ingredients commonly used in hair conditioners. Structurally, they are similar to quats as they have many cationic (positively) charged, quaternized fatty alkyl groups per molecule. As described in previous newsletters, polymers are large molecules consisting of a large number of identical units and may derive from proteins, cellulose, starch, guar gum, silicones and synthetic sources.

Once deposited to the hair, cationic polymers provide hair with slip, manageability and good combability. They also increase body and volume in damaged hair and can improve split ends. One example is soy quat that consists of fragmented (hydrolzed) proteins which attach firmly to the hair shaft, thereby forming a protective layer on the hair cuticles, especially at damaged sites. Soy quat is therefore often used to treat split ends. Another advantage of cationic polymers is that they can overcome the tendency of some quats to leave the hair lank and prone to get greasy.

In most cases, cationic polymers and quats can be freely mixed to get the best of both compounds, and no additional emulsifier is usually needed.

Bodying Agents & Thickeners

As with shampoos, conditioners are perceived to be more effective when thick and creamy. This is usually achieved by using fatty alcohols (e.g. cetyl alcohol), waxes (e.g. carnauba wax, paraffin wax), or gums (e.g. guar gum). Cationic formulas can also be thickened by adding salt (sodium chloride). However, to avoid irreversible break-down of the solution, salt should be added only at very small amounts, only as dilute salt solution (10% max.) and very slowly with constant stirring.

Emollients

Increased gloss & shine and improved combing can not only be achieved with cationic quaternary agents, but also oily compounds. Such emollients usually include natural or synthetic oils, but also esters and waxes. The conditioning effect of oils comes from their hydrocarbon nature as they spread easily onto hair shafts leaving transparent, water-repelling films. These films improve slip, shine, and softness of the hair. Natural oils used in conditioners are, for example, jojoba oil, olive oil, or grapeseed oil. The most frequently used synthetic oils are silicone (e.g. dimethicone) which are even superior to natural oils in terms of film formation, shine and luster.

Quats are the backbone of conditioners

Auxiliary Emulsifiers

Quats themselves have emulsifying properties, but often not enough to make a stable solutions. Therefore, an additional emulsifier is often added. It is important, however, that it is a non-ionic rather than an anionic emulsifier. Anionic emulsifiers are usually incompatible with cationic quats. There is a large variety of non-ionic emulsifiers to choose from, but ethoxylated fatty alcohols (e.g. polysorbate-80 or ceteareth-20) seem to be particularly effective. Nowadays, there are even premixed quat/emulsifier combinations available as, for example, our CreamMaker CAT that combines behentrimonium (quat) with cetearyl alcohol (emulsifier).

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