Viscometer in Cosmetics

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Almost each of us deals with lots of cosmetic products in our everyday life. Creams, lotions, liquids, etc. have become an ordinary and necessary part of life. We often want them to be thicker or on the contrary, more liquid-like. We choose consistency which is better for our skin, but we rarely think that this sphere would be absolutely impossible without science, technical researches and innovations.

Such branch of science as rheology studies deformations and flows of the materials, including elasticity and viscosity. As a rule when it goes about cosmetics it goes mostly about viscosity, because the liquids usually flow easily and they have no signs of elasticity.

Though sometimes there are exceptions, and some disperse substances as body lotions or creams, have got not only the pure viscosity features (when they only flow), but also some features of elasticity. It happens because in these substances polymers affect the mentioned above features studies by rheology. It is important to know the interconnection between the rheological and other properties of the substances as it gives the information about influence of the color, density, hard substances content, molecular weigh on the material properties in general.
From the other side, it gives a lot of information as for the process in which the material under study is taking part. This or another kind of material may require different equipment. Each substance has got molecules which are not the same in size and properties, depending on which different amount of force should be applied to cause the movement of the molecules. Every single time a person is using some cosmetic product a shear force happens: for example, when using body- or hairspray, shampoo, conditioner, lotion out of the bottle, tooth paste in the tube and many others. Each product needs an appropriate viscosity so that the toothpaste did not flow too much or fall out of the tube in pieces and shampoo did not get stuck in the bottle.

Not a single cosmetic product should enter the market without precise check. The latter is carried out with the help of different measuring devices, such as spectrophotometer, refractometer, devices measuring water activity, sorption isotherm generator and of course, viscometer. The latter helps to conduct very quick and very accurate measurements of the perfumery and cosmetic products viscosity.

Depending on the kind of the material different models of viscometer should be used. For example, if we consider the cosmetic products made on the water or oily basis, glass capillary and Hoeppler viscometers with the falling ball are recommended. The viscosity of Newtonian liquids (the above mentioned water-, oil based products) is permanent at a certain temperature and does not depend on the force or speed of deformation.

Many cosmetic products represent non-Newtonian liquids, which mean that there is dependence on many measurement conditions: load, viscometer type, force etc. Rotational viscometers are used for study of the non-Newtonian liquids (Viscometer system of coaxial cylinders or Viscometer with cone-plate system). There are pseudo elastic liquids, like soap, which lose their viscosity under the increasing influence. The long molecules “straighten up” and start flowing, which means the

viscosity becomes lower. Another example is nourishing creams, which belong to Bingham plastic fluids – this viscosity changes only up to a certain point and then it stops, not depending on the level of influence on them. To make the cosmetics stay on the body skin and face the products should have more viscosity, no matter, what it is: face foundation, lip gloss, mascara, nail polish, lotion etc. To compare different non-Newtonian liquids it is necessary to create absolutely similar condition, because the change of just one component may give an absolutely wrong result.

It is very important to consider that each liquid has got its yield point (as well as many other materials). Once the necessary point is achieved it is important not to exceed it, for example as then the properties (viscosity) may change which will bring to the deterioration of the product.

One of the famous related devices is Bostwick consistometer which allows to find out the viscosity level by measuring the distance of the material flow, under the influence of its own mass during a certain period of time. Gels, shampoos, conditioners etc are sometimes tested with the help of that device.

Why and how the demand for the products with certain viscosity changes is hard to predict. It can be connected with the convenience of the application of the product, with the comfort level, reaction of the skin or hair after the application. As an example, people who dye hair often, expect the hair dye to be rather thick, the substances for the perm on the contrary should be liquid and need to flow well. Some people expect the shampoo to be thick, as they are sure, it will make the washing qualities better, though that is absolutely wrong. But exactly the demand of the customers makes the producers search for various ways of improvement the quality and changing their products. There are different ways to influence the viscosity of the cosmetic products. Here are just a few examples of such viscosity regulators and modifiers:

- Cocamide DEA (derivative of the coconut oil fatty acid) – it is a pretty cheap and simple way to intensify the other cosmetic ingredients, in makes the aroma in the cosmetics more stable, it allows water and oil to dissolve in each other which makes the process of cleaning more effective. It is often added to the shampoos and bath foams.

- Propylene Glycol – it is transparent viscose liquid which can be produced in a chemical way out of the petroleum refining products. Alongside with lots of it good qualities it also influence the viscosity of the products which is used to change the consistency of the lotions and lip-sticks texture.

- Stearyl and cetearyl alcohol having a softening effect etc.

In spite of their “unfriendly” names many of the substances used as viscosity modifiers not only are not harmful, but have got really positive influence on skin and hair. One of the important issues is that many customers are against of modifiers and are afraid of the names mentioned in the ingredients list. The task of the producer is not only to reach the desirable level of viscosity of the product, but also to do that in the most favorable for the customer’s health way.

Generally speaking, to be successful in the cosmetics and personal care industry a big attention should be paid to both, the demand from the customers’ side, as well as all the chemical and technical issues which are the core of that cosmetics production and cannot be ignored. The correct measuring devices are an inevitable means of creating a good-quality product.