

Luviquat® Sensation: Innovative polymer for shampoos and hair care products with excellent conditioning properties

By Dr. Claudia Wood*



Luviquat® Sensation is a high performance conditioning polymer for rinse-off applications. In shampoo, Luviquat® Sensation provides excellent wet and dry hair benefits even without the use of silicones.

Luviquat® Sensation opens a new dimension in conditioning. Despite its high cationic charge density, Luviquat® Sensation can be formulated with a broad variety of anionic surfactants. The high charge density ensures that damaged hair receives the exact amount of conditioner it needs to repair and revitalize itself. An extremely thin structure is formed without causing buildup, making the hair feel soft and natural. Depending on the usage concentration, hair volume can be effectively controlled, and frizz is significantly reduced. Moreover, stylability and coloring behavior improve.

Luviquat® Sensation is delivered in an aqueous solution, which makes it easy to formulate and to process. No pre-swelling or emulsification is needed. More flexibility and less complexity offer a new degree of freedom for formulating shampoos.

Luviquat® Sensation, with INCI name of Polyquaternium-87, is a light viscous (80-400 mPas at 23°C) aqueous solution with concentration of 26 wt.% solids. It can be easily handled to formulate shampoo and cleansing formulations. The average polymer molecular weight is 100,000 – 170,000 g/mol. The cationic activity is depending on the pH value and is about 5.2 meq/g at pH 5.5 and about 3.7 meq/g at pH 7.3.

The cationic charge density of Luviquat® Sensation is considerably higher than that of market products which are in the range of 1-1.5 meq/g. The formulation of high charge density polymers is not generally possible in cleansing formulations due to instabilities with the anionic surfactant environment. The combination of high charge density at low molecular weight and formulation stability is a unique

feature of the new polymer. Higher molecular weights cationic polymers frequently lead to excessive build-up on the hair.

Excellent wet combability

Luviquat® Sensation offers best in class wet combing benefits at concentrations as low as 0.2 %.

Fig. 1 shows the result of wet combing force reduction of rinse-off conditioning shampoos with Luviquat® Sensation and other cationic polymers / silicone combinations which are widely used in the market products.

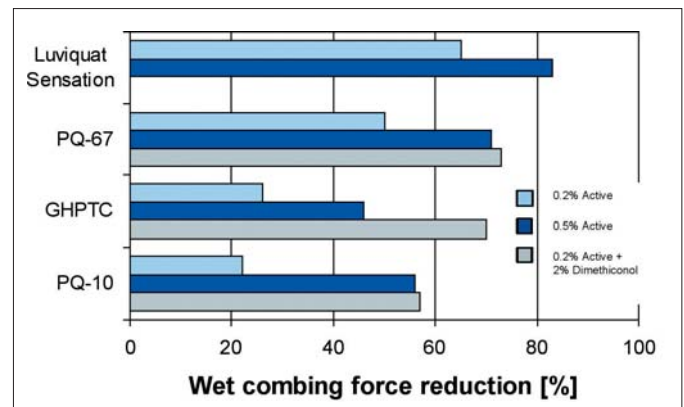


Fig. 1: Wet Combing Force Reduction (Diastron method)

Superior Volume Control

Luviquat® Sensation provides clearly visible anti-frizz benefits. Asian hair swatches were treated with a branded market shampoo claiming strong conditioning benefits. On the right example, 0.2% Luviquat® Sensation was added to this shampoo. (Fig.2)

As shown in the picture, hair swatch on the right clearly demonstrates the capabilities of making hair less frizzy with better volume control.

* BASF SE, Care Chemicals, New Business & Application Development



Fig. 2: Picture of hair swatches

Improved Stylability and Easy Wash-Out

In comparison to GHTPC/Silicone combination, the following graphs show that Luviquat® Sensation is able to improve stylability and is more easily washed out with no long term build-up observed.

Fig 3 indicates the curl retentions after shampooing without styling products. Shampoo with Luviquat® Sensation showed better curl retention. The same results have been observed when styling products are applied after shampoo. These results imply that Luviquat® Sensation improves natural curl retention and makes the hair style last longer.

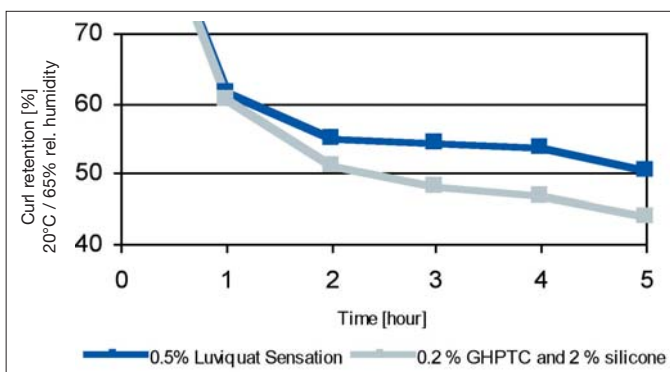


Fig. 3: Curl retention after shampoo

In the graph of Fig. 4, the change of wet combing force reduction was examined to see how quickly the deposit on hair would be removed with cleansing shampoo with no conditioning polymer. With 2nd cycle of washing after the treatment with conditioning shampoos, wet combing force reduction became 0% for Luviquat® Sensation based shampoo, which indicates easier wash-out behavior of the conditioning system with Luviquat® Sensation than that of with GHTPC/Silicone combination.

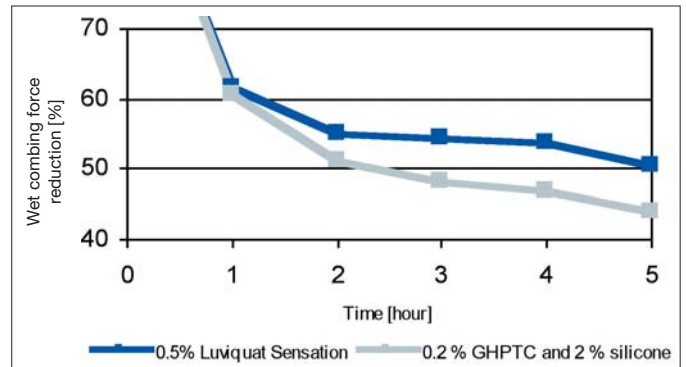


Fig. 4: Wash-out Behavior

Mechanism of Action

For the closer look on hair surface with Luviquat® Sensation, AMF images were taken before and after treatment with Luviquat® Sensation. Two pictures in Fig. 5 show the exact same area of the hair.

As shown in Fig. 5, Luviquat® Sensation forms an extremely thin patch network, approx 10 - 20 nm thick, on the hair's surface where it reduces the friction of the hair fibers. This implies very little weight so that volume can be preserved.

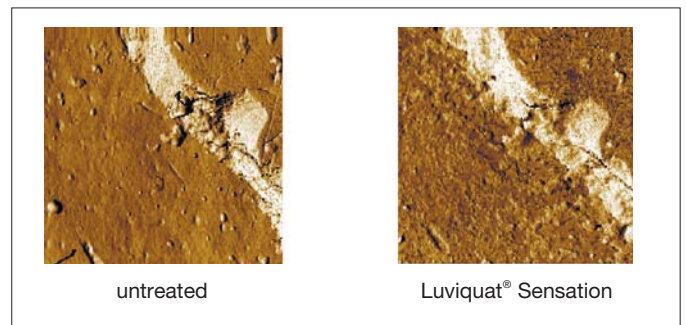


Fig. 5: Atomic force microscopy (AFM) images

Summary

Luviquat® Sensation with unique properties and characteristics provides benefits to a formulator.

- Excellent wet- and dry combability
- Excellent conditioning and sensory properties
- Conditioning properties can be adjusted by different use concentrations
- Excellent formulation stability in combination with anionic surfactants
- Allows silicone-free formulations
- Easy handling and processing as a liquid