APPLICATIONS OF POLYMERS IN HAIR CARE

Gary Martino and Frank Nowak

National Starch and Chemical Corporation
Bridgewater, New Jersey 08807

Over the past 5-10 years, the hair fixative industry has undergone somewhat of a metamorphosis due largely to changes in hair styles and a new surge in creativity in both the salon and consumer retail segments. Greater segmentation of the market is a continuing trend. New product forms and formulations have emerged. Products such as the "spritz" and "scrunching spray" were unknown until recent years. Superimposed upon this scenario is the impact of the ever strengthening movement toward "environmentally friendly" products. New polymers have emerged to provide features required of these new systems. Older polymers are also being widely used in a variety of new ways. Rapid market change continues. In this paper we review polymers and formulations in the context of newer product types and market trends.

INTRODUCTION

Polymers are among the most highly, widely functional classes of raw materials available today to the cosmetic chemist. No single category of raw materials can perform so many functions in today's sophisticated, diverse hair care systems. Be they polyether polyols, silicone polymers, modified carbohydrates, vinyls or acrylics, they perform functions that no other class of raw materials can.

What is it that produces such versatility of polymers in hair care? There are two major factors. First, it's their rigidity due to molecular size and chemical composition providing hair fixing properties and conditioning, often without the greasiness associated with lower molecular weight raw materials. Second, a polymer's chemical functionality produces certain subjective effects. Also the ability of chemists to modify the molecular size, chemical composition, and functionality is the main reason for the extreme versatility of polymers in cosmetics. In many cases the polymer can be tailored to meet specific needs or applications.
POLYMER FUNCTIONS IN COSMETICS

Polymers can be utilized for six general functions in hair care applications.

1. **Fixatives**: in which their rigidity and moisture resistance hold hair and keep it held in place even under conditions of high humidity.

2. **Thickeners**: in which high molecular weight and chemical functionality bind the vehicle used in the formulation into a highly viscous, three-dimensional matrix.

3. **Conditioners**: in which a variety of different polymer types (silicones, modified proteins, and cationic, water soluble vinyl, acrylic and carbohydrate polymers) are placed on the hair from either a lotion or shampoo to impart any of a variety of subjective properties. Among the properties are ease of combing, gloss, body, manageability and static dissipation properties.

4. **Dye assists**: in which water soluble, cationic polymers are used to form chemical bridges between anionic dyes and hair to facilitate deposition of the dye, enhance color uniformity, resist dry rub-off and improve color density.

5. **Opacifiers**: in which certain hydrolytically stable latex polymers are utilized in aqueous systems to support the visual perception of richness or creaminess.

6. **Emulsifiers**: in which surface active polymers are used to emulsify oils in creams and lotions without contributing the oiliness or greasiness of the stearate esters which are commonly used as emollients.

The three major functions of polymers are as fixatives, thickeners, and conditioners. Let’s look at each major function individually, the applications, polymers used, and some of the reasons for their use.

**FIXATIVE POLYMERS**

Fixatives represent the largest application, by far, for cosmetic polymers in hair care. Through a combination of film formation on the hair shaft and "seam welding" or "spot welding" the fibers to one another, fixatives hold hair in place. What are the properties of good hair fixatives?

1. **Solubility**

The polymer must be soluble in the solvent/propellant systems commonly used. Generally, this is not a problem when polar solvents and propellants are used, since most of the commonly used fixatives are themselves polar. In aerosol hair-sprays, non polar hydrocarbon propellants, however, will adversely effect low temperature stability for all commonly used resins.