The Science of Encapsulation or Enhanced Attractiveness of Cosmetic Products

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Abstract

Cosmetic products have many purposes to fulfil. The best summary is given in the cosmetic directive: "A 'cosmetic product' shall mean any substance or mixture intended to be placed in contact with the various external parts of the human body (epidermis, hair system, nails, lips and external genital organs) or with the teeth and the mucous membranes of the oral cavity with a view exclusively or mainly to cleaning them, perfuming them, changing their appearance and/or correcting body odours and/or protecting them or keeping them in good condition"[(1)]. There is, however, a big emotional consumer wish for well being, good looks, attractiveness and much more. A product that represents itself as fulfilling these wishes should additionally underpin this by the attractiveness of the packaging, the formulation, product claims and often just by visible effects. Encapsulation offers the visualisation of customers' wishes inside a cosmetic product. It has been an aspect of cosmetic formulations for many years and the available encapsulation techniques are manifold. This article focuses on attractive, visible and active encapsulation forms such as spheres, beads, films and crystals based on cellulose and capsules based on agar and alginate.

Introduction

Encapsulation can be achieved in many different ways and the shell or membrane of a capsule can be made of many different materials. It can be the flexible membrane of a liposome, consisting mainly of lecithin or a rigid membrane based on synthetic polymers. Both have different properties to fulfil. While the liposome is designed to penetrate skin, a polymeric particle remains on the skin's surface. In the past, polymeric materials were automatically meant to be made of purely synthetic materials. Today, with increasing development into sustainable raw materials, polymeric ingredients from natural sources such as starch or cellulose take more and more space in the cosmetic world.

The different kinds of polymeric encapsulation techniques are based on two main forms. One is a matrix structure where, for example, a colour, an active, a fragrance or flavour could be located somewhere in the matrix (Figure1 on page 2). The other main form is a capsule with a shell and a hollow space inside that could be filled with a liquid or dispersion (Figure 2 on page 2).

The number of different polymers that can be used for this kind of sphere formation is huge and the behaviour of the spheres can be quite different[(2)]. Shell materials commonly used include polyesters, polyurethanes and polyureas[(3)]. Some spheres have a hard structure, enabling their use as a scrub. Materials used to form, cross-link or harden the shell must be screened for any unwanted reaction with the core ingredients, as well as for their toxicological potential; residual monomer content can pose a problem as can the presence of residual solvent[(3)]. Others provide a soft structure which allows the release of encapsulated materials upon the application of pressure. This effect is applicable for the matrix as well as the shell sphere. In some cases, specifically when scrub materials were used, the natural alternatives even had disadvantages. Not only were they much more sensitive to bacterial contamination but they also had relatively sharp edges, derived from the milling process, for example apricot kernels, olive kernels and other natural sources.

All the advantages of purely synthetic polymers are also applicable for spheres based on natural materials. Additionally the spheres can be created as scrubs with rounded shapes, no longer creating micro fissures on the skin during their application.

In one respect the purely synthetic materials were limited, this limitation being the round shape. When attractive transparent shower gels with coloured spheres were developed, the only shape available was a round particle. Natural polymeric materials offer much more. They can be made available in various kinds of shapes such as stars, hearts and other forms. The production method is different and therefore offers different forms. Another important aspect is that these shapes are hard as long as they do not come into contact with water. After the incorporation into a formulation based on water, they start to soften so that upon application the consumer does not feel them.