ANNALS of Faculty Engineering Hunedoara
– International Journal of Engineering
Tome XV [2017] – Fascicule 3 [August]

ISSN: 1584-2665 [print; online]
ISSN: 1584-2673 [CD-Rom; online]
a free-access multidisciplinary publication
of the Faculty of Engineering Hunedoara

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INVESTIGATION OF A MICROCAPSULATED LABEL ON A PREMIUM PACKAGING

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Abstract: Due to innovation, there are more and more kinds of special packaging at our disposal, which are realized in a creative form. According to OECD and the EU: "Innovation is the introduction of new or significantly improved products (goods or services) or processes, new marketing methods in business practices, in a workplace organization or in outer relationships." The aim of this research was to test a packaging for cosmetics which has unique solution, containing a micro-encapsulated label. The cardboard box of the product was covered with BOPP foil, to prevent the box from the damage. On the BOPP foil was fixed a label with micro-encapsulated layer. There is a short text for the consumers on the label to test the smell of the face cream. When the costumers scratch the encapsulated layer they could test and feel the scent of the face cream in advance. Abrasion resistance and temperature resistance of micro-encapsulated layer were examined.
Keywords: packaging, micro-encapsulated label, abrasion resistance, temperature resistance

1. INTRODUCTION

Microcapsules are regular or most often irregular structures built up of one or more polymers which are provided with a permeable coating. Micro-encapsulating is a process in which a substance (core) is enclosed in another protecting material (shell). There are, chemical, physico-chemical and mechanical micro-encapsulating processes, the micro-encapsulated particles differ in size, morphology and shape. The particles the diameter of which is larger than 1μm are called micro-particles, while the smaller ones nano-particles. Micro- and nano-particles can be capsules or spherese. The difference is between the relationship between the core and the shell. In case of a microcapsule these two can easily be isolated, while in case of a microsphere there are no such sharp limits [1] [2].

Nowadays, several fields of use of microcapsules are known (food industry, cosmetics and pharmaceutical industry, agriculture, biotechnology, detergents, textile industry, graphic and printing industry, photography, as well as biosensors, active coating, electronics, etc.). Since the 1930s, seasoning substances and since the 1940s vitamins have also been encapsulated. The technology mainly aims at strengthening their stability and at protecting the compounds, as well with different trace elements or in the case of food enriched with vitamins [3] [4]. Making use of their favorable qualities they are also readily used in the cosmetics industry.

The five sensory organs of the people play major role in marketing. The sense of smell, the aromas often affect the decisions during a consumer purchase. However, to be find out new marketing ideas are more and more difficult, so it is now primarily used as marketing tools for the design of packaging, that is affect more than one sensory organ.

The sense of smell is one of our most important senses it belongs to the lymbic part of our brain like creativity, emotions and memory. The sense of smell and taste are in a direct relation with each other and influence each other. With the help of our tongue we can feel the basic tastes (salty, bitter, sweet, sour and spicy hot) but it is the sense of smell that helps us feel a lot of flavors. Fragrances are readily used in marketing and the advertising industry to win the consumers over and to motivate them. In the case of the box provided with a special layer, realized during the research work also this plays a major role [5] [6].

2. METHODS

The aim of the research work was to test the packaging of a cosmetic product containing a micro-encapsulated label. On the finished packaging tests were done, in the interest of product protection suitability. In the functional tests we examined how the packaging resists mechanical bearing forces while the product gets to the consumer through the distribution chain. The main aim was to determine the length of time in the course of which the encapsulated layer keeps the fragrance. The experiments were done in the material testing laboratory of SunChemical Hungary Printing Ink Ltd. The fragrance samples are delivered to the company in an already encapsulated form, the final homogeneous blend is due to the flow of ink that has been mixed by shaking, by vibration blender or biaxial blender. The ink can absorb a maximum of 35% dry material the strength of fragrance depends on it. The samples can keep their fragrance for half a year as is expected.

Depending on the examinations, test strips of different sizes and numbers were made on IGT C1 printability tester. A thin layer of ink of predetermined amount (1.5-2 g) was applied on the inking rollers, which was abraded (for about 120 s) until a thin, even layer of ink was formed on the rollers.

As a next step, the form cylinder was inked with this thin layer of ink, then the pressing force depending on the applied base material was set, finally the prints were made on the precut substrates. The applied layer was dried for a few seconds. The thickness of the applied ink layer was determined by the mass of the form cylinder weighed before and after printing, which equals 1.5 µm with an amount of ink on paper of 1.5 g/m^2. While printing, side abrasion was switched off, but even so there were capsules that broke up during the examinations. Abrasion resistance and temperature resistance tests were done on the test strips.

We examined how resistant the micro-encapsulated samples are to abrasion. The tests were carried out with manual abrading as well as on Taber Abraser 5135 abrasion testing equipment. Scent-printed paper strips of 3x3.5 cm size were abraded with a given number of abrasion, and we examined if the label is still sweet-smelling after 24 hours of evaporation, and if yes, to what extent. The intensity of the fragrance was checked with the help of six different people with "good sense of smell", who scored the intensity from 1 to 10. The tests were also done with BOPP foil (in case the box is covered with a layer of foil and during delivery the boxes are placed on one another in the multipack. The instrument test was done with a load of 2.4 g/m^2 and 11.8 g/m^2. In the first case the mass of 1 box, while in the second that of 5 boxes was modelled. This can be an important factor during delivery and lading. The tests were increased with a scale of 50. The abrading surface was 6.5 x 6.5 cm^2 BOPP foil.

It was also examined how the scent-capsules react to extreme, very high and very low temperatures. The circumstances of delivery were modelled with these tests. The tests were carried out with the help of climate test chambers of Discovery 110 type. The equipment is suitable for heat-retaining, cyclic tests on wide scale, thus simulating the different environmental effects affecting the sample. The scale of programmable temperature can extend from -40 °C to + 180 °C. The even distribution of vapour content and temperature is ensured by strong air circulation of great performance. For the climate test cycles the relative humidity can be programmed between 10% and 98%. The starting temperatures of the tests were -5°C, 45°C and 75°C. The scents on the samples were checked every hour. Relative humidity was 60%.

3. RESULTS AND DISCUSSION

The ready product is additionally wrapped in BOPP foil with a wrapping machine, which further increases the resistance of the product to stress. The wrapping covers the whole box closing it at the bottom surface with a seam. To draw the consumer's attention to it, a label with the sentence "Rub it!" was placed on it, minding not to cover any important information or graphics (Figure 1).

Figure 1: The box packaging with two different label solutions

Abrasion resistance

Figure 2 shows the results of manual abrasion. The scent lost its strength a little already after 50 abrasions but only after 500 abrasions lost its fragrance totally.

Figures 3-4 show the results of tests done on abrasion testing equipment of Taber Abrasion 5135 type. The examinations showed that as an effect of abrasion with BOPP foil, already after 200 abrasions, the strength of scent decreased by 50%, under the load of 2.4 g/m², and after 160-170 abrasions under the load of 11.8 g/m². But in both cases, the fragrance could be felt after 300 abrasions.

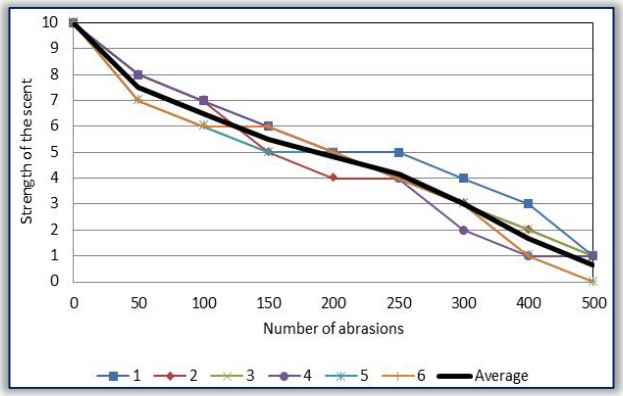

Figure 2: Abrasion resistance tested manually

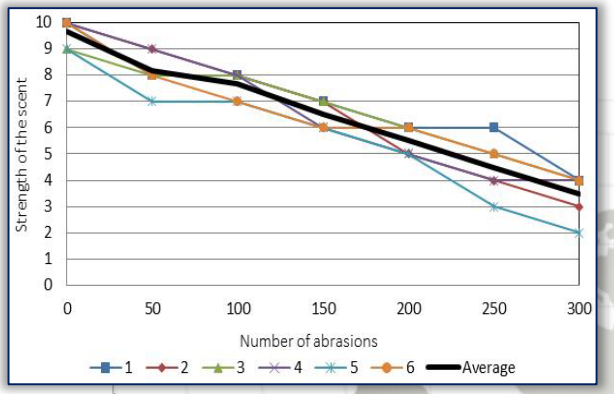

Figure 3: Abrasion of BOPP foil and the label to each other, under the load of 2.4 g/m²

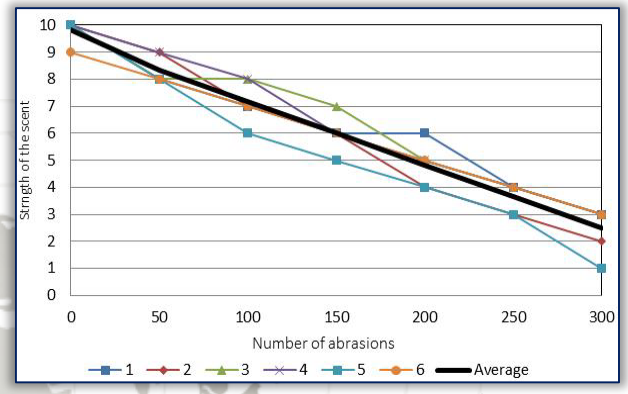

Figure 4: Abrasion of BOPP foil and the label to each other, under the load of 11.8 g/m²

Temperature resistance

The results of temperature resistance tests are shown on Figures 5-7. They show that the micro-encapsulated layer keeps its sweet-smelling ability better under cold conditions.

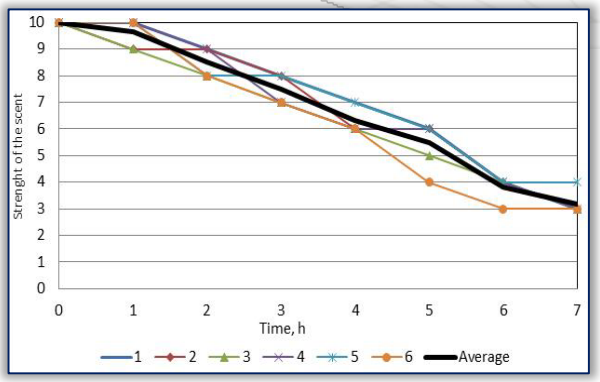

Figure 5: Cold (-5°C) resistance during delivery

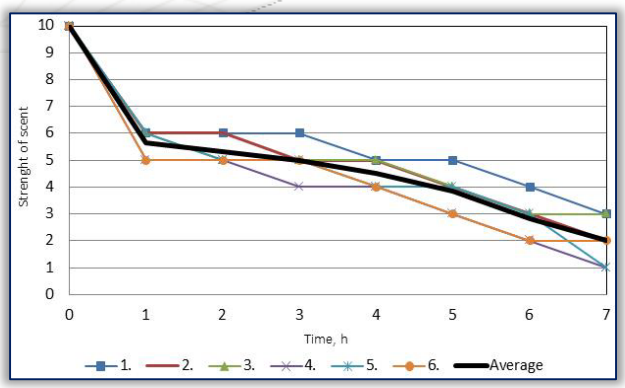

Figure 6: Hot (45°C) resistance during delivery

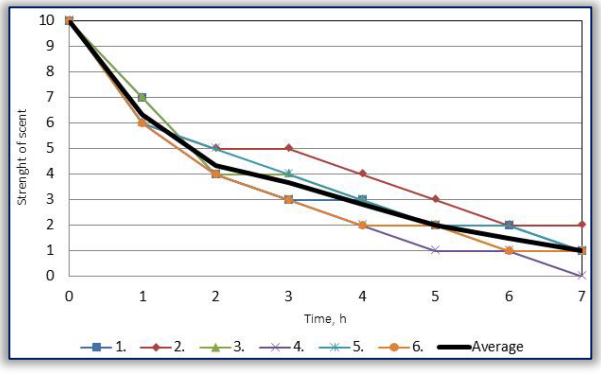

Figure 7: Hot (75°C) resistance during delivery

4. CONCLUSIONS

In the course of the research work, testing of the packaging containing a micro-encapsulated label were carried out.

The results of the abrasion resistance test of the sweet-smelling layer in case of both manual abrasion and between the scented label and the BOPP foil show that the label can lose some of its fragrance already during delivery. But after a large number (500) of manual abrasion – although it loses some of its strength – the fragrance remains.

During weather resistance tests the qualities of the packaged product (facial cream) were taken into consideration. Due to the good heat-isolating glass jar and the base material of the box, the cardboard, the facial cream is more resistant to weather changes. During the examination the extremity of delivery circumstances served as a basis. The results showed that the micro-encapsulated layer keeps its sweet-smelling ability better under cold conditions. So, in summer it is worth delivering it in air-conditioned cars so that it can keep its special quality.

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