Dielectric Properties of Selected Cosmetic Cream

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Abstract:

The measuring results of a dielectric constant analysis of creams samples that were not exposed to sunlight or X-rays and which were measured while it is attached to the water (the water was considered as a phantom for human skin tissue) showed that QV and Cetaphil creams have the highest dielectric constant (about 3500) compared to the rest of the creams Fair & Lovely, Diana, and Rose. After creams were exposed to sunlight the dielectric constant of Fair & Lovely, QV, Cetaphil, Diana, and Rose was increased to about 1000. And after creams were exposed to X-ray the dielectric constant of Cetaphil cream increased to 4,000 and the rest of the creams Fair & Lovely, QV, Diana and Rose the dielectric constant raise slightly up to 1200. These changes may lead to the ability to ion exchange between the cream and the human skin (perspiration in the skin).

Keywords: *Creams, Dielectric constant, X-rays, Sunlight, Skin*

I. Introduction

Skin color is determined by the concentrations of three main pigments, which are melanin, hemoglobin, and carotene. These pigments are found in the interior of the skin and accumulate to produce the pigment on the surface of the vital tissue including the pigment of the skin, eyes, and mucous membranes. A defect in the concentrations of these substances may give a different change in the color of skin and other visible tissues it may contribute to the diagnosis of a skin disease or problem. [1].

Lightening creams contain a specific substance that reduces the speed of melanin production in the outer layers of the skin. Melanin expresses the brown pigment produced by the pigment cells in the skin. Although melanin is a natural way to protect the body from the harmful effects of ultraviolet radiation, exaggerated protection may causes skin colorlessness in addition to other skin disorders. Brightening creams manufacturers reduce the action of the enzyme, and tyrosine which controls melanin production levels in the skin, and products that contained effective ingredients help treat skin pigmentation problems. [2].

Women seek in various ways to show the skin the appearance of freshness and vitality by using many creams and medicinal preparations to lighten the skin, but some of these creams have severe and significant damage not only to the skin but also to health in general, there are many types of creams used without a prescription to lighten and whiten the skin color It is often harmful in one way or another on the outer layers of the skin because it removes the outer layers of the skin, where 80% of dermatologists confirm that skin-lightening creams are not safe, sometimes the patient only needs proper nutrition or drinking water as the creams do not useful for them but harm to the health.[3].

There are creams that are not authorized to use, and a large number of skin-whitening creams contain dangerous and illegal chemicals. The most frequently used of these dangerous compounds is a steroid, where it is used in large quantities with other compounds such as hydroquinone and it contains bleaching materials that are forbidden to use only by doctors only and some Creams contain a chemical hazardous chemical corticosteroids, these substances are often useful in skin treatments such as psoriasis or skin eczema and are taken under medical supervision in certain doses, but in the case of use to lighten the skin involves several risks such as Excessive lightening of skin color and delicacy of the skin. Uneven patches of skin color or smears may occur on the skin, causing severe irritation and redness. Therefore, they hurt the skin as in general and cause damage. A case of vitiligo may occur. It is a medical condition with which complete paleness of the skin occurs in general. [4].

Some types of skin-lightening creams contain mercury, which is a great danger to the body, [5] as mercury leads to poisoning, and its symptoms appear in many psychological and neurological problems. It also leads to an imbalance in the kidney function, fetal damage in a pregnant woman, and increased chances of cancer Skin in the case of using skin-lightening creams, and more often when exposed to sunlight immediately after using creams.

UV rays are found in sunlight, and are emitted by electrical curvature or black light. They are rays that may cause a chemical reaction, and make many substances glowing or phosphorescent. Many people have realized the effect of ultraviolet radiation on the body, causing cases of heat stroke, but the spectrum of these rays has other effects that may be beneficial or harmful to human health.

The UV exposure that comes with sunlight is an environment that is a carcinogen. The toxic effect of ultraviolet radiation originating from sunlight or artificial therapy lamps is a matter of concern to human health. Serious effects of radiation on the skin include burns, skin infections, sunburn and weakening of the body's immune system. [6]~[8].

Long UVA, UVB, and UVC radiation can destroy collagen protein fibers and thus accelerate skin aging Table (1), **[9].**UVA and UVB rays can break down vitamin A in the skin.

TABLE I

Name	Wavelength (nm)	Photon energy (eV, aJ)	Notes/alternative names
UVA	315-400	3.10-3.94 (0.497 - 0.631)	Long-wave, black light, not absorbed by the ozone layer, soft UV
UVB	280 - 315	3.94 - 4.43 0.631 – 0.710)	Medium-wave, mostly absorbed by the ozone layer, intermediate UV
UVC	100 - 280	4.43 – 12.4 (0.710 – 1.987)	Short-wave, germicidal, completely absorbed by the ozone layer and atmosphere, hard UV

II. Samples Preparation

A questionnaire was made and distributed to a targeted group of girls, who are university students, because they are the most used creams, as the questionnaire showed a variation in the types of creams they use and the most used creams that are classified as skin-lightening creams such as: Bioderma, Nivea, Rose, Diana, and Fair& Lively.

The questionnaire also showed that girls use body lotions such as Citaphil and QV. Each cream and lotion divide into three groups, the first one was exposed to X-rays (U = 35Kv, I = 1 mA, time 3 min), and the second group was exposed directly to the sunlight for 3 hours (from 7am to 10am) which is the average time the girl is exposed to sunlight in the day according to the questionnaire, the last group was covered with a black fabric (veil) like a type of that girls wear, and exposed for 3 hours under sunlight (from 7am to 10am).

Tubes are occupied by creams or lotion that without exposure to anything, and tubes in which creams or lotion are occupied after they are exposed to X-rays, and other tubes where creams or lotion are placed in after they are exposed to direct sunlight, and then tubes occupied with creams or lotion after they exposed to direct sunlight in the presence of a veil.

Another group of tubes fill half of distilled water and the other half put creams or lotion in it without being exposed to anything, distilled water with creams or lotion after being exposed to X-rays, distilled water with creams or lotion after exposure to direct sunlight, distilled water with creams or lotion after exposure to sunlight The direct presence of a veil.

It is worth mentioning that the cream-water samples were used to emulate the cream on the human skin in such a way that the water acts as a phantom for the human tissue. Indeed, as we will demonstrate, we have observed different electrical properties for sample with different cream in contact with water.

III. Results and discussion

The results of measuring the dielectric constant with the frequency of creams that not exposed to sunlight or X-rays showed that the dielectric constant of QV and Citaphil creams is the highest value (about 3500) compared to the rest of the creams Fair & Lovely, Diana and Rose which are within (1000) as shown in the figure 2a. It is worth noting that these results are specific to the samples, which were measured by the presence of water, which represents a simulation model for the tissues of the human body. Therefore, the increase in the properties of the dielectric constant indicates a decrease in the ratio of ionic interaction between the cream and the human skin (for example, the transmission of sodium ions in the perspiration the body and the cream).

As for Figure 2B, it shows that the exposure of the creams to sunlight affected on the QV and Citaphil creams, as it reduced the value of its dielectric constant from 3500 to about 1000, which is the dielectric constant for the rest of the creams that were not affected by sun exposure (1000), which leads to an increased possibility of an ionic reaction rate between the cream and human skin.

In Figure 2c, we find that exposure of creams to X-rays, the dielectric constant of QV cream decreased from 3500 to 1200, while the rest of creams Fair

&Lovley, Diana and Rose the dielectric constant increased slightly to about 1200, while in Citaphil cream the dielectric constant increased from 3500 to 4000. And accordingly the ratio of ionic reaction between Citaphil cream and human skin will decrease, therefor the possibility of the ratio of ionic reaction between cream and human skin to the rest of the creams increases.

IV. References

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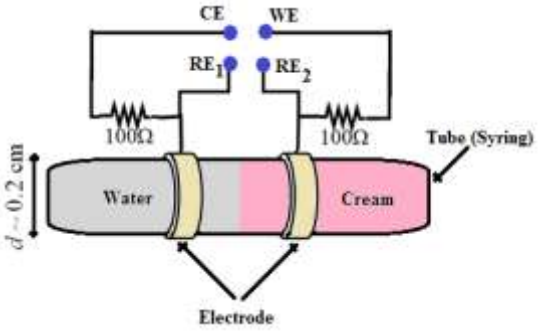

Figure 1

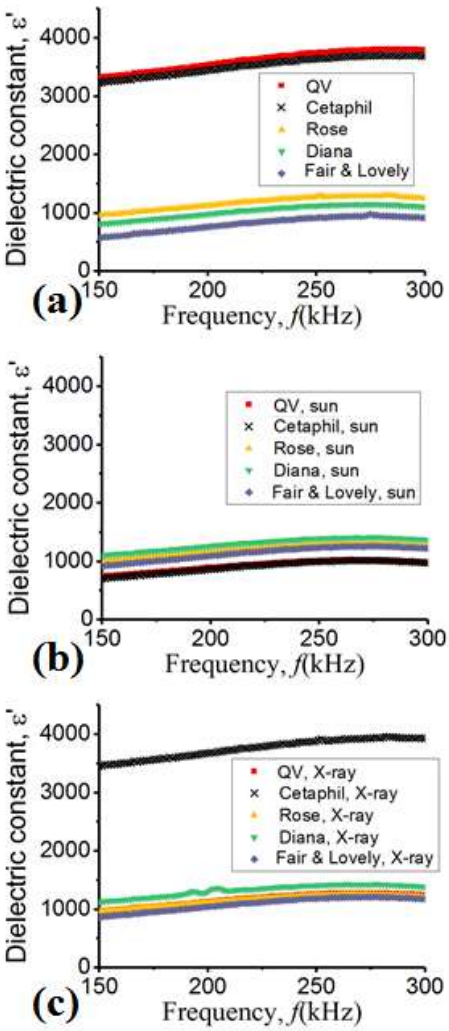

Figure 2