Changes in Fatty Acid and Squalene Sorption on Latvian Clays after Removal of Calcium and Magnesium Carbonates

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INTRODUCTION

Clays and clay minerals are widely used in cosmetics, health care and therapeutic products as active ingredients and excipients. Due to their sorption properties clays are used as facial masks for removal of toxins, excess sebum (secretion of sebaceous glands) and as treatment of skin inflammations, such as acne, boils and ulcers [1]. Acne is a skin disease, which is thought to be developed by increased production of sebum. Sebum is a mixture of lipids composed mainly of triglycerides, wax esters, squalene, fatty acids, cholesterol and cholesterol esters. Recent research has shown that acne patients have 59% more sebum with a level of squalene being 2.2 times higher compared to healthy population [2]. Another skin disease is seborrheic dermatitis, caused mainly by increased levels of oleic acid (a fatty acid) [3].

An important factor for the use of particular clays in cosmetics and health care is the mineralogical composition. From non-clay minerals in clays the most abundant are quartz, carbonates (calcite and dolomite) and feldspar. The presence of carbonates causes alkaline conditions, which can be irritating to the skin. Majority of the clays used in cosmetics are within the pH range of the skin (pH 5–5.5), as well as near neutral [4].

Latvia has large clay reserves traditionally used in building materials and pottery. The most part of cosmetic clay masks available in Latvia contains illite, which is the abundant clay mineral in Latvia. Nevertheless, only 3% of these products are made in Latvia [5]. Therefore, the aim of this study is to evaluate the possibility of application of Latvian clays in cosmetics as active ingredients.

MATERIALS AND METHODS

In this study, clay samples with different mineralogical compositions from Laža, Prometejs and Iecava deposits were used. Sample fraction < 63 μm was obtained by wet sieving. Calcite and dolomite were removed by means of dissolution in citric and oxalic acids. During the dissolution process the clay suspensions were stirred and the acid was added stepwise to keep the pH above 4.5. All carbonates were dissolved after 2–3 days, when the pH became constant – approximately 5. The excess acid was removed by centrifugation. Then the clays were washed several times with two methods: 1) 1M NaCl solution and distilled water and 2) only distilled water. The mineralogical composition before and after removal of carbonates was determined using X-ray diffractometer (XRD).

Sorption experiments were performed with squalene and two fatty acids (oleic and stearic) in heptane or squalane media. Clay powder was mixed with a corresponding solution and left still for 10–20 minutes. The adsorbed amount was determined using UV spectrophotometer.

RESULTS AND DISCUSSION

The sorption of fatty acids and squalene depends on the used organic acid and washing method. Oleic acid sorption on clay samples is greater than that of squalene.

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