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COSMETIC INNOVATION DAYS

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## PHYSICAL CHEMISTRY & FORMULATION

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# Mineral ingredients, a better structural control for sustainable cosmetics formulation

Natural mineral ingredients such as mica, metal oxides, silica or carbonates are part of beauty rituals used by women since immemorial time. In ancient Egypt, eyes were painted with malachite or galena (Manniche, 1999). Earth's minerals, including precious as gold, are now entering the composition of cosmetics or even creating a new trend as bare minerals. Nowadays, minerals should appear at the top of the ingredient list. They provide for example, a broad-spectrum UVA/UVB sun protection. Sensitizers as phyllosilicates control the efficiency of the long-lasting coverage or the silk-like feeling. Theirs tons allow true skin tone to be visible at the same time providing a flawless and even coverage. They also control the type of abrasives in toothpaste (silica, sodium bicarbonate or calcite). They also have some active virtues. Their physical and chemical properties are combined at all levels with astonishing properties at nanoscale. Their characterization is essential in formulation studies, throughout the up-to-point for understanding properties of fillers as well as mutual interactions related to granulometry. That is the case with the "creamy effect" allowing pure powders to replace funds dyed for a full coverage for example.

Minerals knowledge at the French Geological Survey (BRGM) has been our routine for more than 50 years (Bizi et al., 2003). The mineral particles are characterized by their size, morphology, chemical composition, crystal structure, surface area, size distribution, agglomeration state, surface charge, solubility or dispersibility, etc... Nowadays, the challenge is to apply all this metrology to nanometric particles. This is the subject of research so called, nanometrology.
We have recently developed analytical protocols on a brand new FE-SEM (field emission gun, scanning electron microscope). For example, the size of the smallest particles can be analyzed through a STEM option "scanning transmission electron microscopy." In this way, resolution can be increased and nanoparticles or micro-aggregates can be easily analyzed. Technology has improved so much that TiO2 and ZnO can be micronized to a degree that they don't leave the telling whiteness of the previously larger crystals on the skin. When minerals are employed, they scatter light and give the illusion of perfection. How to characterize these properties?

We also have a coupling technique to get in line, morphology, composition by EDS technique and crystallinity by Raman spectroscopy, on the same particle. This way, analyses of formulae or separate ingredients are possible. During this conference we will show some of the most demonstrative examples as TiO2, ZnO, SiO2, mica, etc…

M Bizi, M.P Flament, P Leterme, G Baudet, A Gayot. Relation between structural characteristics of talc and its properties as an antisticking agent in the production of tablets, European Journal of Pharmaceutical Sciences Volume 19, Issue 5, August 2003, Pages 373-379.
L Manniche. Sacred Luxuries. 1999 Cornell University Press, New York. 127-143.