ISIS@MACH ITALIA

Science and Technology Facilities Council
ISIS Neutron and Muon Source

Experiment Proposal

Experiment number GP2023021

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Co-investigator (*)	Dr Chiara Niespolo, Arterra Bioscience Spa, ITALY
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Experiment title	SEM-based investigations of powdered-formulated ingredients for functional make-up
MRF Instrument	**SEM ZEISS SIGMA**
Access Route	Direct Access
Science Areas	Chemistry, Materials, Technique Development
Sponsored Grant	None
Grant Title	-
Start Date	-
Similar Submission?	-
Industrial Links	-

Days requested: 4
Previous GP Number: -
DOI: -
Sponsor: -
Grant Number: -
Finish Date: -

Non-Technical Abstract

The aim of the proposed project is to determine the structural and surface properties of powdered natural ingredients generated from a combination of vegetal extracts with different substrates.
With the data generated by SEM we can select the best mixtures for our final product; the ultimate goal of the current project is the development of functional make-up.

Publications -

ISIS neutron and muon source

IM@IT E-platform: No

Instruments	**Days Requested:**
Access Route	**Previous RB Number:**
Science Areas	**DOI:**
Sponsored Grant	**Sponsor:**
Grant Title	**Grant Number:**
Start Date	**Finish Date:**
Similar Submission?	
Industrial Links	

Sample record sheet

Principal contact Dr Chiara Niespolo, Arterra Bioscience Spa, ITALY
MRF Instrument **SEM ZEISS SIGMA** **Days Requested:** 4
Special requirements:

SAMPLE

Material	Synthetic Mica+ plant-derived cosmetic active ingredients	Synthetic Zeolite +plant-derived cosmetic active ingredients	-
Formula	Fluorphlogopite ($KMg_3AlSi_3O_{10}F_2$) complex with plant-derived cosmetic active ingredients	Zeolite (CAS: 1318-02-1) complex with plant-derived cosmetic active ingredients	-
Forms	Friable powder	Friable powder	
Volume	cc	cc	
Weight	10 g	10 g	
Container or substrate	Standard falcon tube	Standard falcon tube	-
Storage Requirements	-	-	-

SAMPLE ENVIROMENT

Temperature Range	- K	- K	-
Pressure Range	- mbar	- mbar	-
Magnetic field range	- T	- T	-
Standard equipment	Do Not Know	Do Not Know	-
Special equipment	-	-	-

SAFETY

Prep lab needed	No	Yes	-
Sample Prep Hazards	-	-	-
Special equip. reqs	-	-	-
Sensitivity to air	No	No	-
Sensitivity to vapour	No	No	-
Experiment Hazards	-	-	-
Equipment Hazards	-	-	-
Biological hazards	-	-	-
Radioactive Hazards	-	-	-
Additional Hazards	-	-	-
Additional Details	-	-	-
Sample will be	Disposed of by instrument scientist	Disposed of by instrument scientist	-

Science Case

SEM-based investigations of powdered-formulated ingredients for functional make-up

Background and Context

In the last few years, powder formulated ingredients have become very popular in the cosmetic market. Powders are generally more stable than liquid products, have a longer shelf life and preserve the biological activity better than a liquid ingredient. Interestingly, they contain fewer or even no preservatives at all. However, nowadays it is difficult to find powdered cosmetic formulations containing functional active ingredients on the market. Here, we propose to investigate the microstructural properties of different substrates either natural or synthetic, alone and in complex with our plant-derived cosmetic active ingredients. Among the substrates, we have chosen mica and zeolites. In fact, mica powder is already used in the make-up products for its great filler and texturizer properties. It also improves skin sensation, adhesion and slip. On the other side, zeolites, despite being less used in the cosmetic market, show very interesting properties, including the ability to reducing greasiness of oil-containing formulations and adsorb different molecules through their pores. This project is part of an industrial research unit focused on the development of functional powdered make up and raw material ingredients.

Proposed experiment

The aim of the proposed project is to determine the crystal reticle morphology of substrates alone and in complex with natural extracts. In this way we will obtain valuable and unique information on the size, the shape and the dispersion of powdered ingredients. We think that ISIS@MACH ITALIA offers the instruments that we need to achieve this information. Specifically, we would like to have access to the Scanning Electron Microscopy (SEM). By applying SEM, we hope not only to be able to discriminate the best combination of substrate/active for the cosmetics market but also to improve our knowledge of microstructural analysis.

Summary of previous experimental proposals or characterisation

We have previously applied two different techniques (mixing by spray-drying and by zirconia ball mill) to generate our test powders. In particular, we have combined two different natural extracts with 4 different substrates: natural and synthetic mica and natural and synthetic zeolites. We have developed an in-house ex vivo test assay to characterize the biological activity of our powdered-formulated actives; preliminary data showed an increased hydration effect and antioxidant activity of all the combinations active-substrates, compared to the substrates alone.

Justification of experimental proposals request

Dimensional analysis of our mixtures is critical for multiple reasons: it is important to define the microscopic behavior of the powder in order to understand how it will impact the stability of the final formulations. Moreover, we aim to establish how the active part distribute within the substrate and its homogeneity content. SEM with field-emission source seems to be the ideal instrument to achieve this information. It is a powerful technique since it allows a direct observation of both the micropore structure and lamellar surface with high-resolution.