



Project 2 Raman spectroscopy for TiO₂ Nanoparticles mixtures

Objectives

The project will aim to develop validated procedures based on Raman spectroscopy, for the identification and quantification of the three TiO₂ polymorphs in titanium dioxide nanoparticles (NPs) binary mixtures.

Background

Raman spectroscopy is a technique that has grown in the scientific community and is increasingly adopted by industry and end users searching for a reliable and rapid tool in the characterization of materials. It is a fast and ambient technique, and portable instruments are already present in the market, thus allowing in principle *in-situ* analysis.

TiO₂ is the most exploited semi-conductor oxide and it has a wide range of applications, from painting and coating to personal care, health and food products. In nature, three TiO₂ polymorphs exist (anatase, rutile and brookite) with individual physical and chemical features, that lead to distinct functional properties.

Due to their different crystalline structure and subsequent different spatial distribution of the atoms, anatase

brookite and rutile provide different Raman fingerprint spectra.

Standardization Needs

A deeper knowledge of the composition of TiO₂-based products will enable an improved understanding and tailoring of their functional properties. No standard exists to date for the identification and quantification of the three polymorphs in binary mixtures. The development of a validated procedure based on Raman spectroscopy will guarantee both manufacturers and end users about the quality and the performances of the final products.

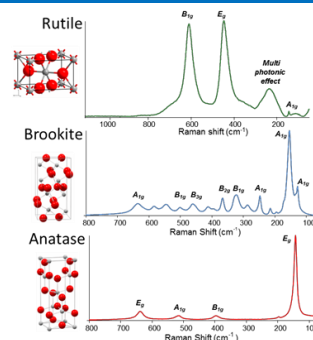
Work Programme

- Develop a calibration procedure with traceability, combining experimental data and chemometrics
- Evaluate measurement uncertainty.
- Development of standardized procedures

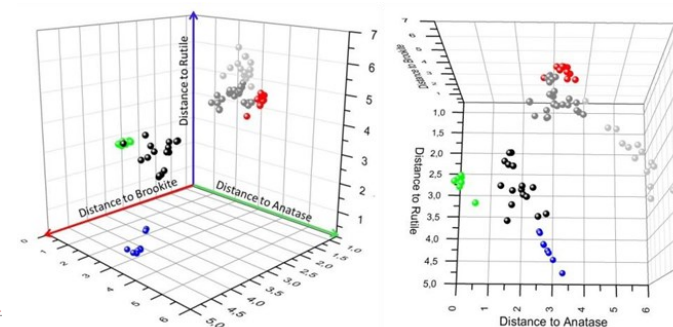
Duration

Two years beginning May 2019.

CALL FOR PARTICIPATION



Raman spectra of the three different polymorphs



Discriminant analysis classification of pure (colored dots) an binary (grey scale dots)

Deliverables and Dissemination

Documentary and physical standards, scientific articles and metrology session in the International Conference on Raman Spectroscopy (ICORS).

Funding

Participants fund their own involvement in the study. Each participant may need up to 5 days' effort to complete the exercise.

References

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