UNIVERSITY OF LIMERICK
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Bernal Institute

Raman Spectroscopy
HORIBA Labram

Overview

Raman spectroscopy is sensitive to molecular and crystal structures and its applications include chemical fingerprinting, crystallite examination in ceramics and the examination of structure and strain rates in polycrystalline ceramics, glasses, fibers, gels and thin and thick films. The Dilor XY Labram spectrometer is equipped with an Olympus BX40 confocal microscope. A ArHe 10mW green laser and a 20mW red laser generate spectra collected with a Peltier cooled CCD detector. For investigations between -196°C and 1000°C a LINKAM THMS600 temperature stage is used.

Technical Details

The options include:

- Motorised XY microscope stage (mapping) with a sample position resolution of 0.5µm.
- High pressure and temperature controlled cell (TMS1000) which can be used for in-situ Raman spectroscopy at temperatures up to 1000°C.
- Computer controlled digital mass flowmeter system allows highly accurate gas flow rates to be used during temperature studies (±0.35% of flow rate).
- Confocal focusing allows samples with various film thicknesses (as low as 0.1 µm.) to be analyzed without interference from the bulk material.

Examples of Application

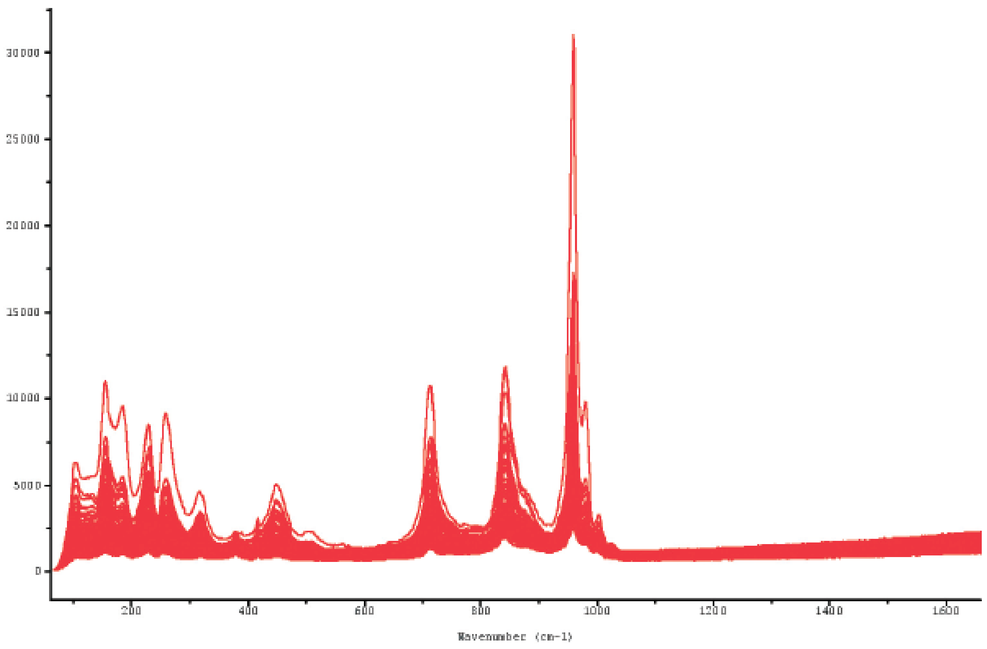
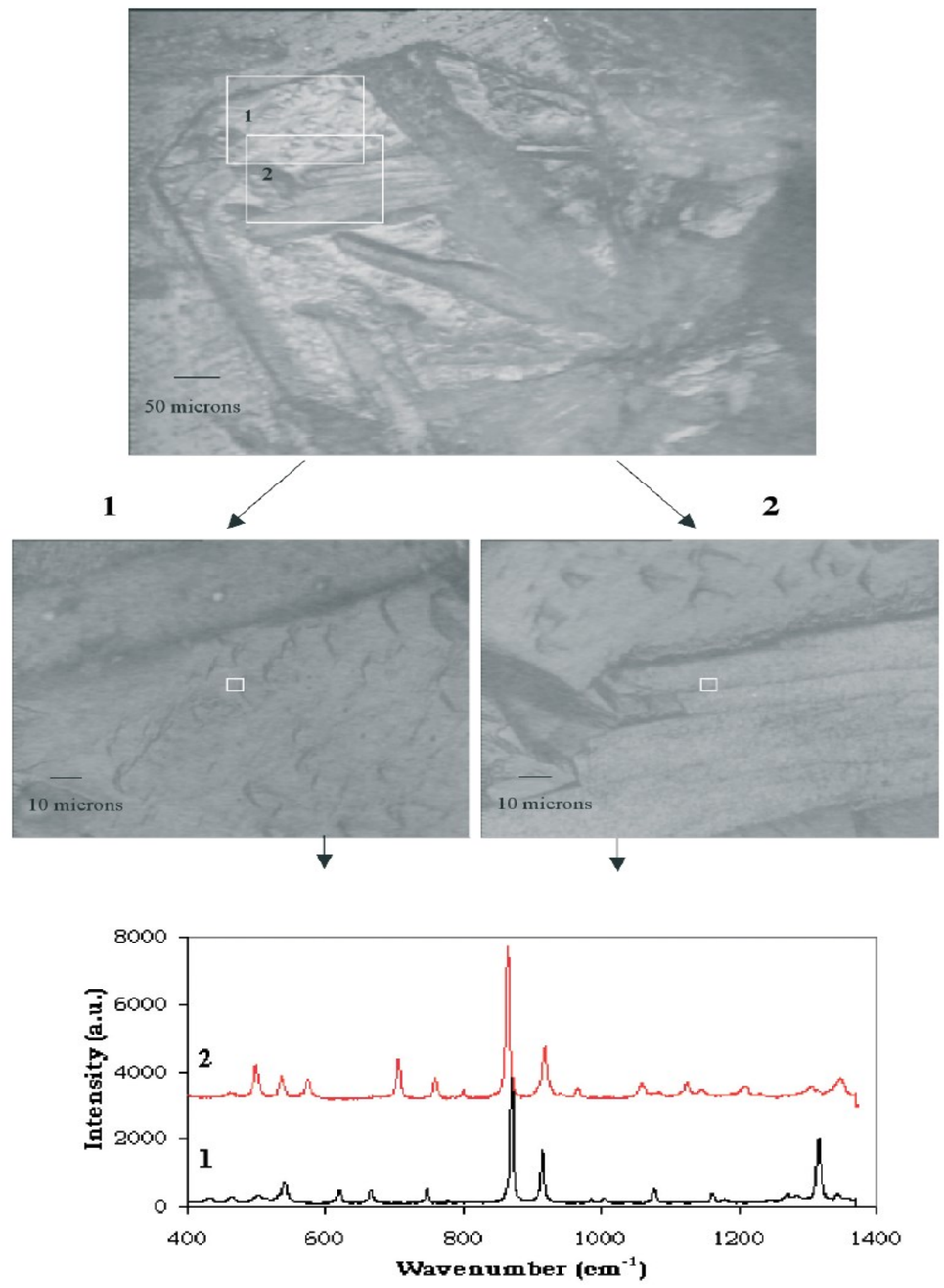


Figure 1: Mapping results of spectra collected in an area of 10 µm x 20 µm on the surface of a powder particle of a catalyst. (Mo V6:1, supported by wet impregnation of alumnia, previously calcined at 1150°C). These spectra illustrate the compositional variations e.g. V2O5 species, MoO (both tetrahedral and octahedral species).



Optical microscope images (x10 and x50) and Raman spectra of (1) α-L-Glu crystals that have (2) β-crystals growing within their structure. Microscopy can confirm the presence of the crystal phase assemblages on the basis of their morphology but their composition and related structure can only be pinpointed and confirmed using Raman spectroscopy.

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