

RAMAN AND X-RAY IMAGING TECHNIQUES FOR PHARMACEUTICAL AND BIOMEDICAL APPLICATIONS

Michael Lykouras, Panagiota Giannoutsou, Stefani Fertaki and

Malvina G. Orkoula

Department of Pharmacy, School of Health Sciences, University of Patras, Greece

Raman spectroscopy has received great attention in solid-state pharmaceutical applications ranging from the verification of raw materials, process monitoring of drug production to quality control of products. Advantages include the speed of analysis, the minimization of sample preparation, the non-destructive character and the flexibility using portable instruments. The increasing need for analysis of small quantity samples (a few milligrams) necessitated the coupling of Raman spectrometers with optical microscopes. Therefore, the detection of a single constituent crystallite is made possible, for which, analysis in bulk would be prohibitive. In order to cover a large amount of the sample, retaining traceability at the same time, mapping is the strategy followed. There, spectra on successive spots, in high spatial resolution, are recorded. Raman images are constructed, revealing the different chemical compositional areas over the sample surface.

The role of X-rays in the observation of thick and non-transparent materials was realized soon after their discovery. Projectional radiography, the practice of producing two-dimensional images using X-ray radiation, finds application in medical diagnosis till nowadays. Some notable examples are the pathological conditions of the skeletal system and the lungs. Computed tomography (CT) combines the traditional X-ray technology with computer processing to generate a series of cross-sectional images of the material (the body) that can later be combined to form a three-dimensional X-ray image. CT images are more detailed than plain radiographs and give the ability to view structures within the body, throughout their volume, from many different angles.

The presentation will emphasize on the application of Raman and X-ray imaging techniques, separately and combined, in pharmaceutical and biomedical analytical questions.