

# IMAGING OF COATED OIL CAPSULES

Gerard van Dalen<sup>1</sup>, Peter Nootenboom<sup>1</sup>, Patricia Heussen<sup>1</sup> and Irene Smit<sup>2</sup>

<sup>1</sup>Advanced Measurement Imaging and Data Analysis & <sup>2</sup>Fat Technology, Unilever R&D,  
P.O. Box 114, 3130 AC Vlaardingen, The Netherlands  
E-mail: Gerard-van.Dalen@unilever.com

**KEY WORDS:** imaging, microscopy, X-ray microtomography, tomography, infrared, electron microscopy, image analysis, visualisation, rendering, chemometry, 3D, XRT, XMT, XRCT, CT, SEM, FTIR, ATR

Coated oil capsules are used to deliver new functional food ingredients (e.g. flavours, carotenoids, flavonoids,  $\Omega$ -3 unsaturated fatty acids). In this study spherical capsules were investigated containing a core with fish oil coated with a transparent gelatine layer. The remaining actives are within a hard coating, which is applied on the gelatine capsules (naked pearls). The total coating consists of about 8 layers. For the microstructural characterization of the coating the following techniques were used: X-ray microtomography ( $\mu$ CT), Scanning Electron Microscopy (SEM), Light Microscopy (LM) and Fourier Transform Infrared (FTIR) microscopy using an Attenuated Total Reflection (ATR) crystal. This study showed that imaging techniques can be used to analyse the microstructure of coated oil capsules. These techniques are very useful for the development of capsules which deliver a constant amount of active ingredients per portion.

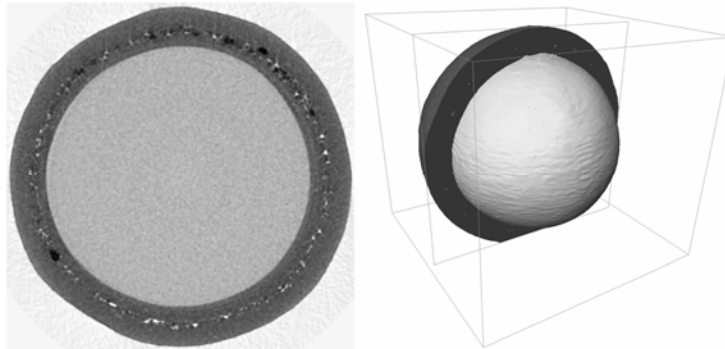


Figure 1:  $\mu$ CT images of a coated oil capsule. Horizontal cross section left, (image width = 6.7 mm) with 3D visualisation showing the clipped wall in red, the oil droplet in yellow and the high density material within the wall in green, box size = 6.9\*6.9\*6.4 mm).

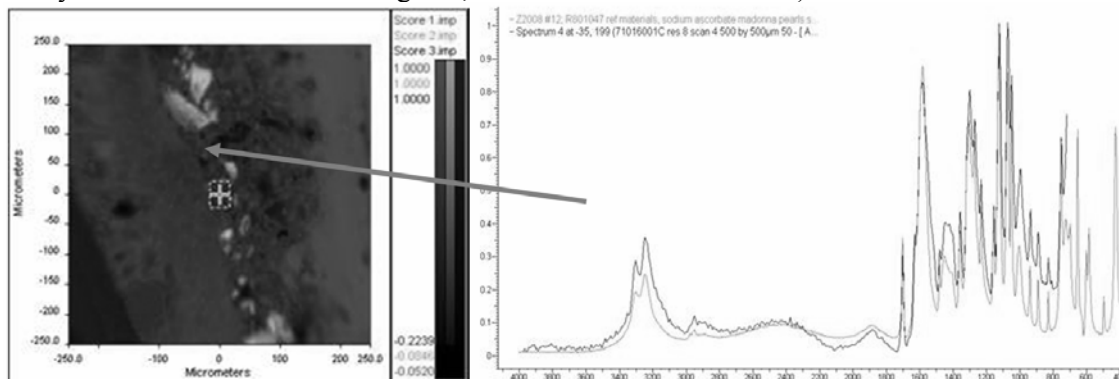


Figure 2: Chemometric analysis of FTIR-ATR-imaging (250 by 250 $\mu$ m) of a part of a cross-section of a coated oil capsule showing the structural information based on the individual spectral images for each pixel (1.6 $\mu$ m). The ingredients sucrose, gum, isoflavone mix and sodium ascorbate are identified and localized by this technique.