RENISHAW®

apply innovation™

Raman imaging of ingredients in bubble gum

Food sciences

Introduction

Raman imaging enables you to easily analyse ingredients at various stages throughout the lifetimes of food products. Gaining an understanding of the ingredients and their relative distributions can lead to manufacturing improvements, higher stability in storage and ultimately a better product.

Renishaw's inVia™ Qontor® confocal Raman microscope was used to identify and image the ingredients on the surface of, and inside, a piece of bubble gum. Bubble gum is primarily composed of a gum base, sweetener, softener, flavours and a powdered coating. The distribution of these ingredients affects the gum's taste and function.

The inVia system provides:
- high chemical specificity to distinguish and identify ingredients
- high spatial resolution to resolve highly detailed ingredient distributions
- LiveTrack™ automatic focus-tracking technology to enable analysis of curved and rough samples, without the need for sample preparation

Identifying and imaging ingredients on the outside of bubble gum

We analysed the outside of an intact piece of coloured bubble gum, using a 785 nm laser to minimise problems from sample fluorescence. We mapped the surface with StreamLine™ imaging technology, as its line illumination reduces laser power density and enables rapid mapping without causing sample damage. We used LiveTrack™ surface tracking technology to maintain focus on the uneven gum surface.

We processed the data with Renishaw's Empty Modelling™ method. This deconstructs the data into chemically significant components, without needing a prior knowledge of ingredients. The components were identified by database matching as: sugar, malic acid, citric acid (flavourants); poly(ethylene-co-vinyl acetate)(gum base); talc and calcite (to prevent adhesion to packaging). The Raman images reveal the complex distribution of materials across the uneven bubble gum surface.
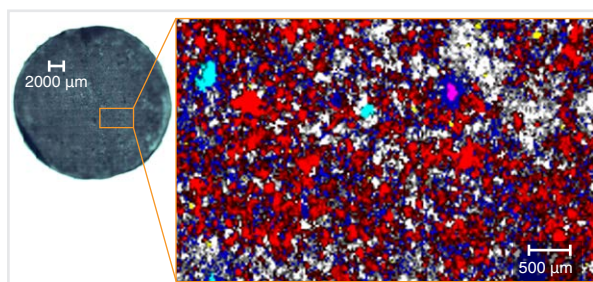

Figure 1a. White light montage of whole bubble gum piece showing analysed area in orange, and overlaid Raman images of the outside surface of the bubble gum, showing talc (white), sugar (red), calcite (yellow), malic acid (cyan), citric acid (magenta) and poly(ethylene-co-vinyl acetate) (blue).
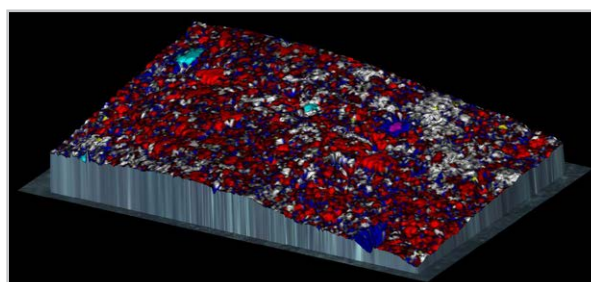

Figure 1b. 3D overlaid Raman images of the outside surface of the bubble gum, showing talc (white), sugar (red), calcite (yellow), malic acid (cyan), citric acid (magenta) and poly(ethylene-co-vinyl acetate) (blue). Surface topography was measured using LiveTrack, which enables high resolution imaging over rough samples.

Renishaw plc

Spectroscopy Products Division
New Mills, Wotton-under-Edge,
Gloucestershire GL12 8JR
United Kingdom

T +44 (0) 1453 524524
F +44 (0) 1453 524901
E raman@renishaw.com

www.renishaw.com

Identifying and imaging ingredients inside bubble gum

A similar measurement and analysis process was applied to a cut piece of bubble gum, to gain an understanding of the distribution of the ingredients on the inside. Talc, sugar and poly(ethylene-co-vinyl acetate) were identified. The image below shows a crystalline structure of sugar, surrounded by a network of talc and the gum base.

The information in these images can be quantified (e.g. percentage coverage, domain sizes) for comparison between multiple samples.
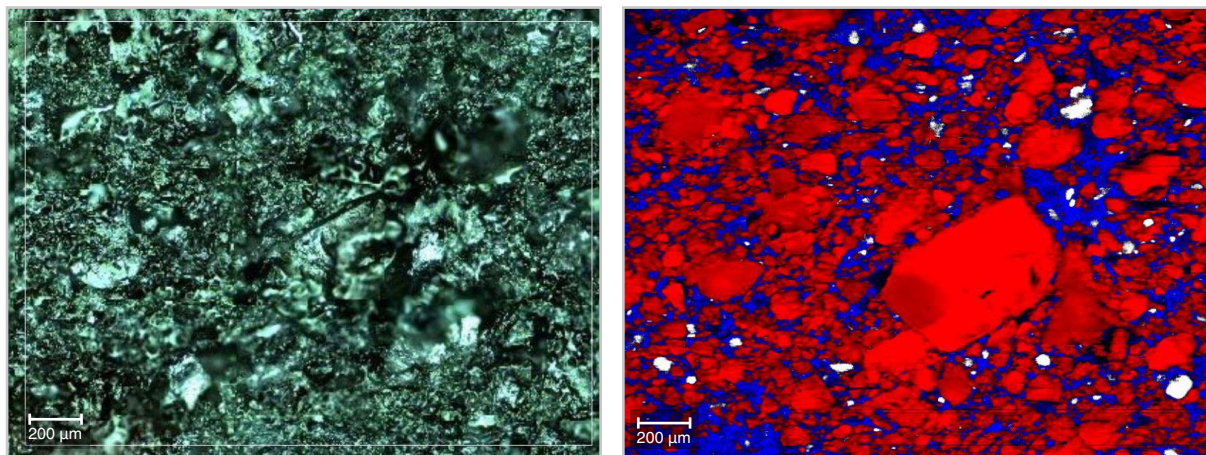

Figure 2. White light montage (left) and overlaid Raman images (right) of an inside surface of the bubble gum, showing talc (white), sugar (red) and poly(ethylene-co-vinyl acetate) (blue).

The inVia Qontor system can be used to analyse a range of food products, such as bubble gum, chocolate and biscuits. The high performance and fast imaging capabilities of this system, as well as LiveTrack automatic focus-tracking technology, enable easy and rapid analysis to understand and improve the food product in all stages of its lifetime, from manufacture to storage and consumption.

The inVia Qontor Raman microscope. The ideal analysis tool for food research and development

- Research grade Raman microscope
- LiveTrack technology for analysing uneven, rough or curved sample surfaces
- StreamLine imaging technology for high speed mapping
- StreamLine Slalom technology for a quick overview of the samples
- High confocality StreamHR™ imaging technology to scrutinise small details
- Flexibility to switch between high and standard confocal imaging
- Powerful WiRE™ software for data collection and analysis
- Queue up measurements to maximise data collection efficiency
- Custom solutions can be developed to meet your exact requirements

The Renishaw inVia Qontor confocal Raman microscope

A range of related Renishaw literature is available. Please ask your local Renishaw representative for more information.

Renishaw. The Raman innovators

Renishaw manufactures a wide range of high performance optical spectroscopy products, including confocal Raman microscopes with high speed chemical imaging technology, dedicated Raman analysers, interfaces for scanning electron and atomic force microscopes, solid state lasers for spectroscopy and state-of-the-art cooled CCD detectors.

Offering the highest levels of performance, sensitivity and reliability across a diverse range of fields and applications, the instruments are designed to meet your needs, so you can tackle even the most challenging analytical problems with confidence.

A worldwide network of subsidiary companies and distributors provides exceptional service and support for its customers.

Please visit www.renishaw.com/Raman for more information.