CASE STUDY

Pharmaceutical

Hyphenated DSC-Raman, a new Powerful Research Tool.

"The DSC-Raman offers the advantage of collecting important data with one simple experiment which is not possible with any other instrument. It's a powerful and exciting tool for material characterization in the early stage of drug development and can take us to the next level of analysis. It also has the potential to provide in-depth understanding of pharmaceutical systems."

– Research Investigator
(a major U.S. pharmaceutical company)

Differential Scanning Calorimetry (DSC) and Raman spectroscopy are complementary analytical techniques. DSC measures thermal behaviors of samples like glass transition temperature (Tg), melting temperature and melting enthalphy, crystallization. While Raman gives insight into the chemical/physical structure of the sample, they are often used to address the same material characterization problem. Simultaneous DSC and Raman measurement offers more information about the material which may be missed by each technique separately. Spectra recorded continuously during the temperature scan can generate curves representing the changes in the Raman spectra for direct comparison with the DSC heat flow curve.

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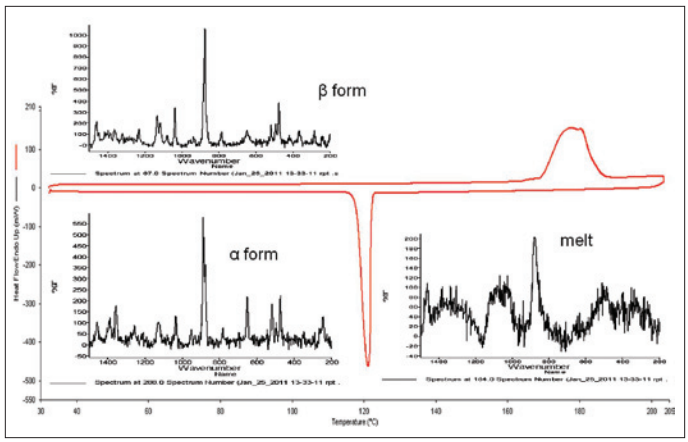
Although both IR and Raman are based on the principle of absorbing and emitting light, Raman spectroscopy is preferred for this combination because it does not require altering the DSC cell to allow transmission, nor does it require working with reflectance spectra. The Raman can analyze not only the surface, but also the inside of the sample, which is more representative of the overall sample behavior. Due to the laser energy, the Raman laser can increase the sample temperature which can be significant on heat flux DSC. The PerkinElmer double-furnace power-controlled DSC can effectively compensate the sample temperature increase.

PerkinElmer introduced the first commercial DSC-Raman system in the world in 2009. Since then, it has been used to address challenging materials characterization problems in the pharmaceutical and petrochemical industries. For pharmaceutical companies, this versatile technology can be used to study:

- Polymorphism
- Phase transition (e.g. crystallization, melting)
- Stability (e.g. decomposition)
- Drug-excipient interaction
- Formulation screening/development

A typical example is the identification of polymorphs in the pharmaceutical industry. A single Raman spectrum can identify a polymorph or provide quantitative information about a mixture of polymorphs, while DSC observes the transitions between them as a function of temperature.



DSC-Raman of D-Mannitol.

DSC-Raman from PerkinElmer.

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