Raman Spectroscopy Case Study:
The Dissolution of Amorphous Solid Drug Dispersions

Francesco Tres\textsuperscript{1}
Graham Rance\textsuperscript{2}

\textsuperscript{1}Laboratory of Biophysics and Surface Analysis, School of Pharmacy, University of Nottingham.
\textsuperscript{2}Nottingham Nanotechnology and Nanoscience Centre, University of Nottingham
The Solubility of New Drugs

Research Case Study

• The drug development process identifies many chemicals with useful pharmacological activity.

• A high proportion of these also have poor dissolution and solubility profiles, and as a consequence poor bioavailability e.g. felodipine.

• Amorphous solid dispersions of water-insoluble drugs with water-soluble polymers represent a possible solution.

• But release profiles of amorphous solid dispersions remain poorly understood, with little chemical or time-resolved information.
Raman Spectroscopy

Research Case Study

- A (confocal) microscopy technique for real-time, ‘in-situ’ chemical and morphological analysis.
- Uses spontaneous inelastic scattering of light to generate spectra unique to a material’s molecular composition and state.
Optical Microscopy reveals that the dissolution profile of the felodipine amorphous solid dispersion depends on the loading of the drug in the polymer.
• Time resolved spectral analysis on sample variations highlight chemical differences and changes.
Raman Mapping

Research Case Study

- Then possible to image and record the spectral changes representative of subtle chemical differences such as the change in crystallinity with dissolution.
• Optical microscopy reveals the dissolution profile of the amorphous solid dispersion depends on the loading of the drug in the polymer.

• Raman spectroscopy reveals that:
  
  o **Low drug loadings** – the drug and polymer dissolve as a single entity.
  o **High drug loadings** – the drug and polymer dissolve on different time scales, enriching the concentration of the drug as the polymer dissolves and leading to re-crystallisation.

• This research demonstrates the critical role Raman spectroscopy can play in understanding the release profile of poorly water-soluble drug molecules.
For further information on how Raman spectroscopy, or the Nottingham Nanotechnology and Nanoscience Centre could help with your applications, systems and designs please contact:

isac@nottingham.ac.uk
+44(0)781 645 3130
www.nottingham.ac.uk/isac

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For more details on the work showcased in this case study see the following publications: