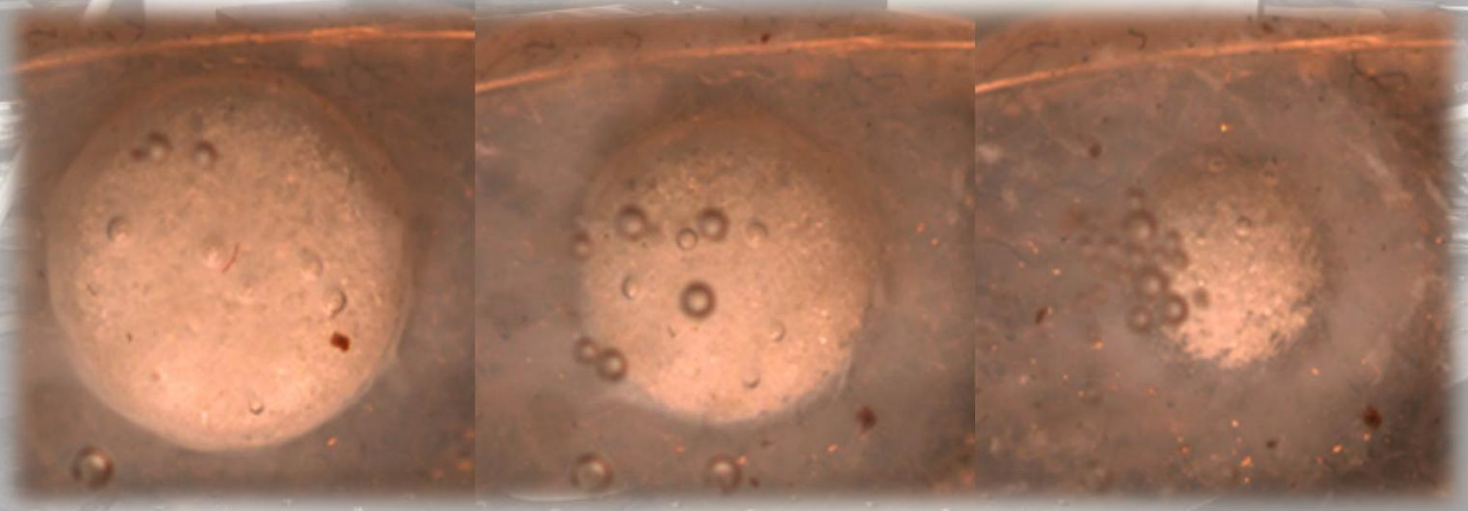
# Raman Spectroscopy Case Study:

# The Dissolution of Amorphous Solid Drug Dispersions



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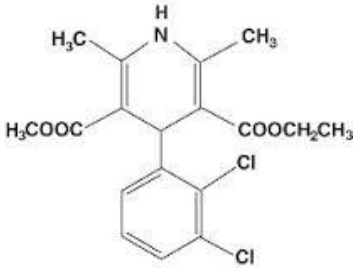
# The Solubility of New Drugs

## Research Case Study

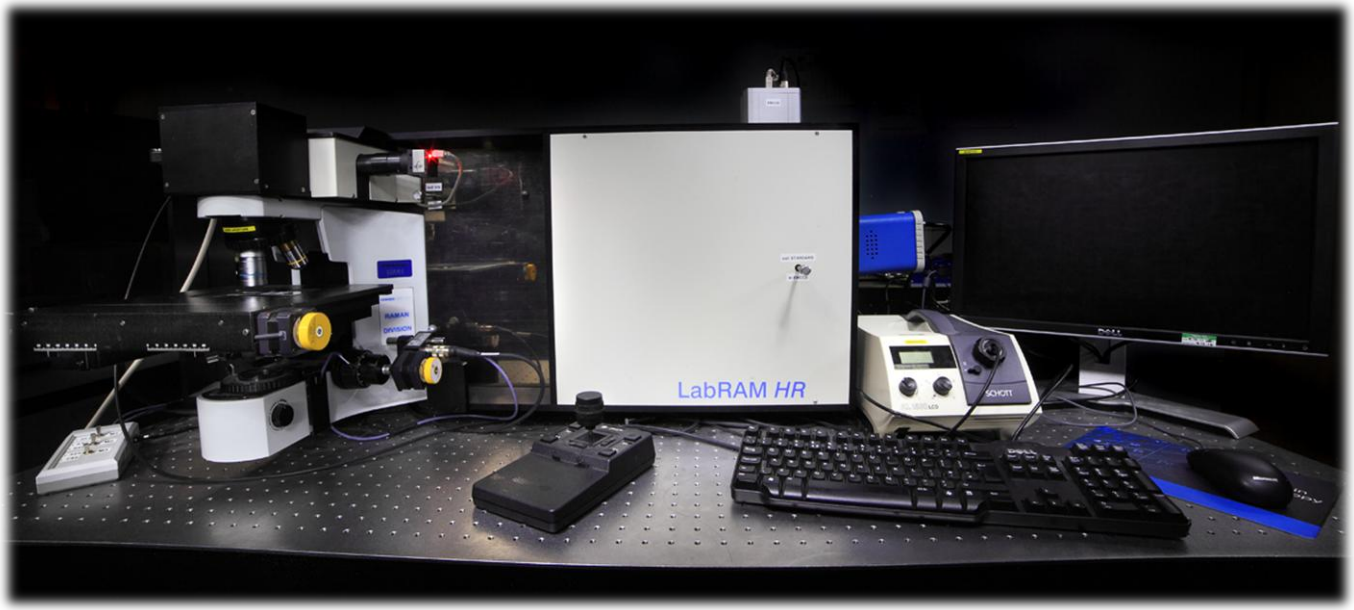
- The drug development process identifies many chemicals with useful pharmacological activity.
- A high proportion of these also have poor dissolution and solubility profiles, and as a consequence poor bioavailability e.g. felodipine.
- Amorphous solid dispersions of water-insoluble drugs with water-soluble polymers represent a possible solution.
- But release profiles of amorphous solid dispersions remain poorly understood, with little chemical or time-resolved information.




# Raman Spectroscopy

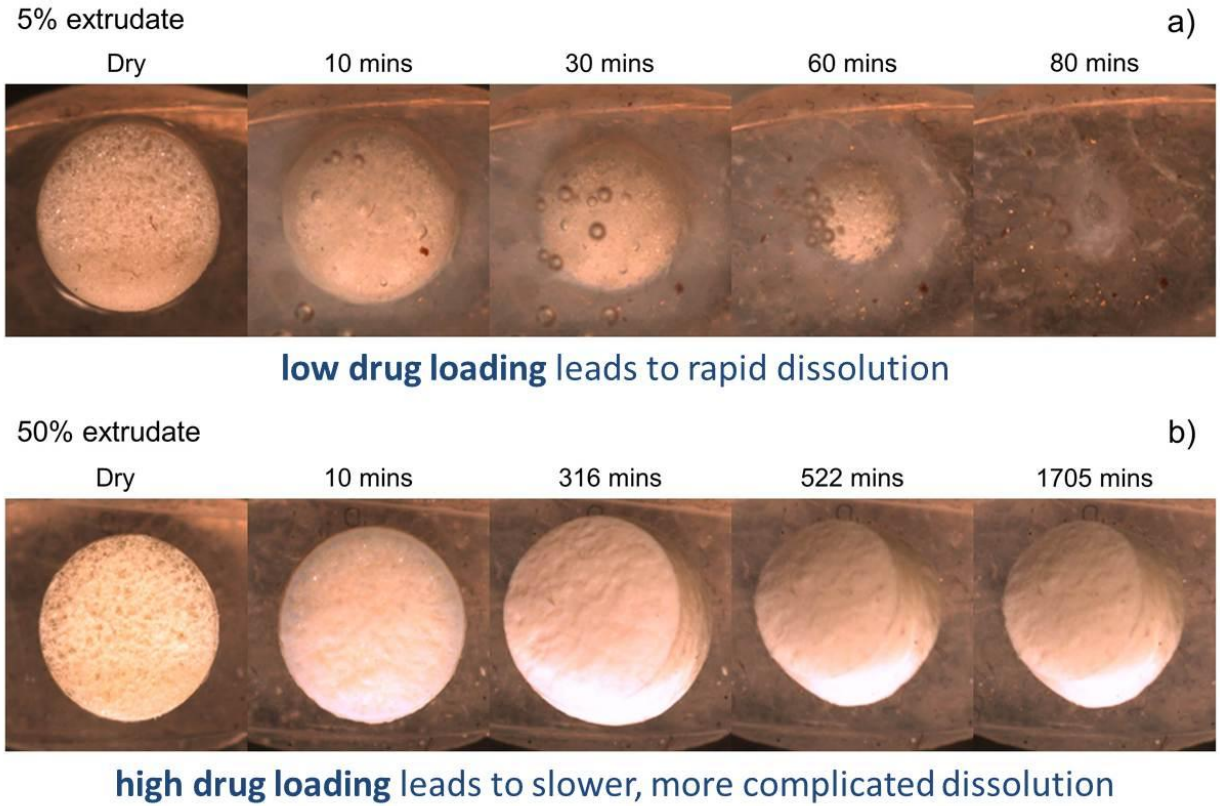
## Research Case Study

- 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

## Research Case Study

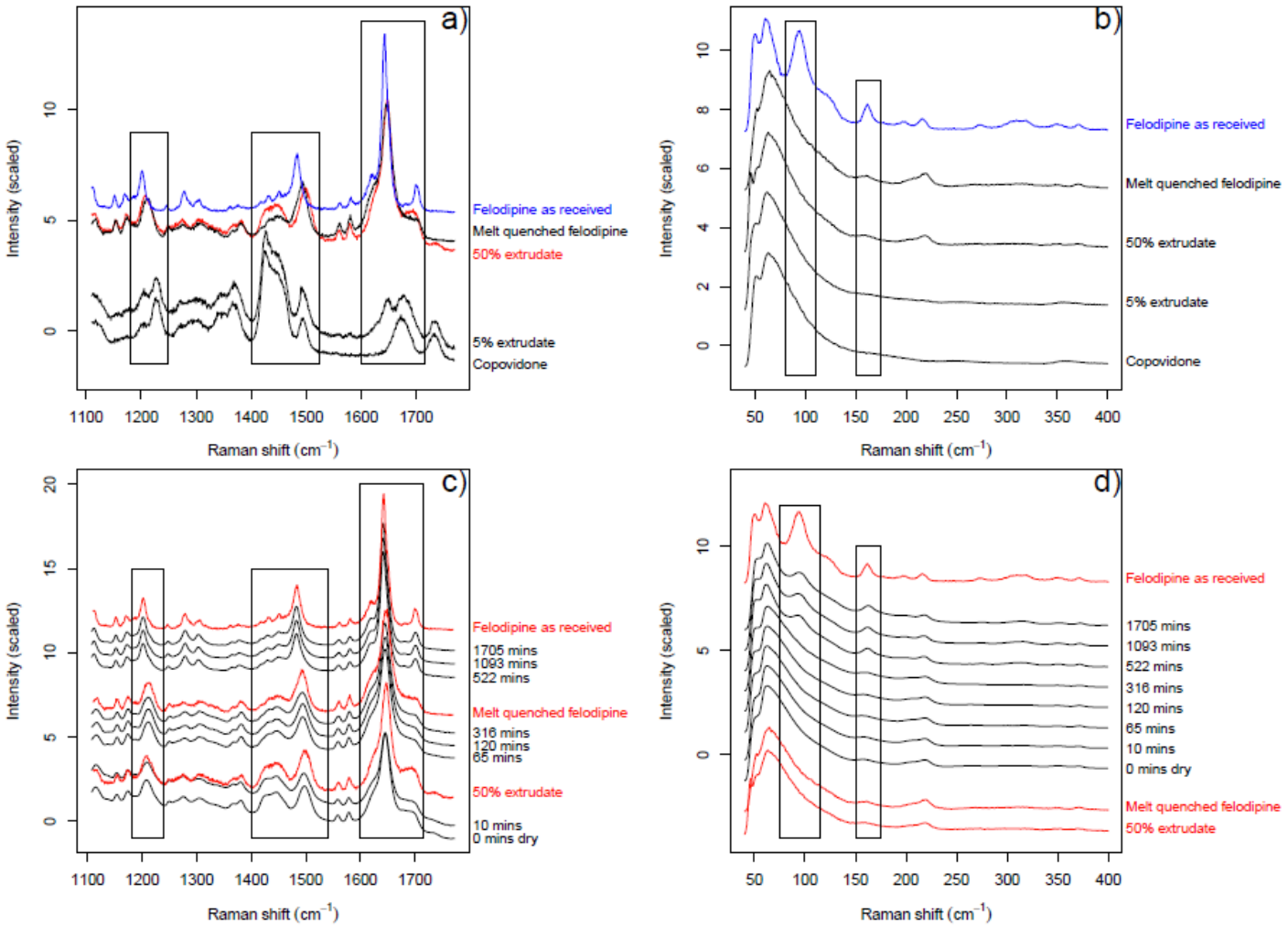



- Optical microscopy reveals that the dissolution profile of the felodipine amorphous solid dispersion depends on the loading of the drug in the polymer.

# Raman Spectroscopy

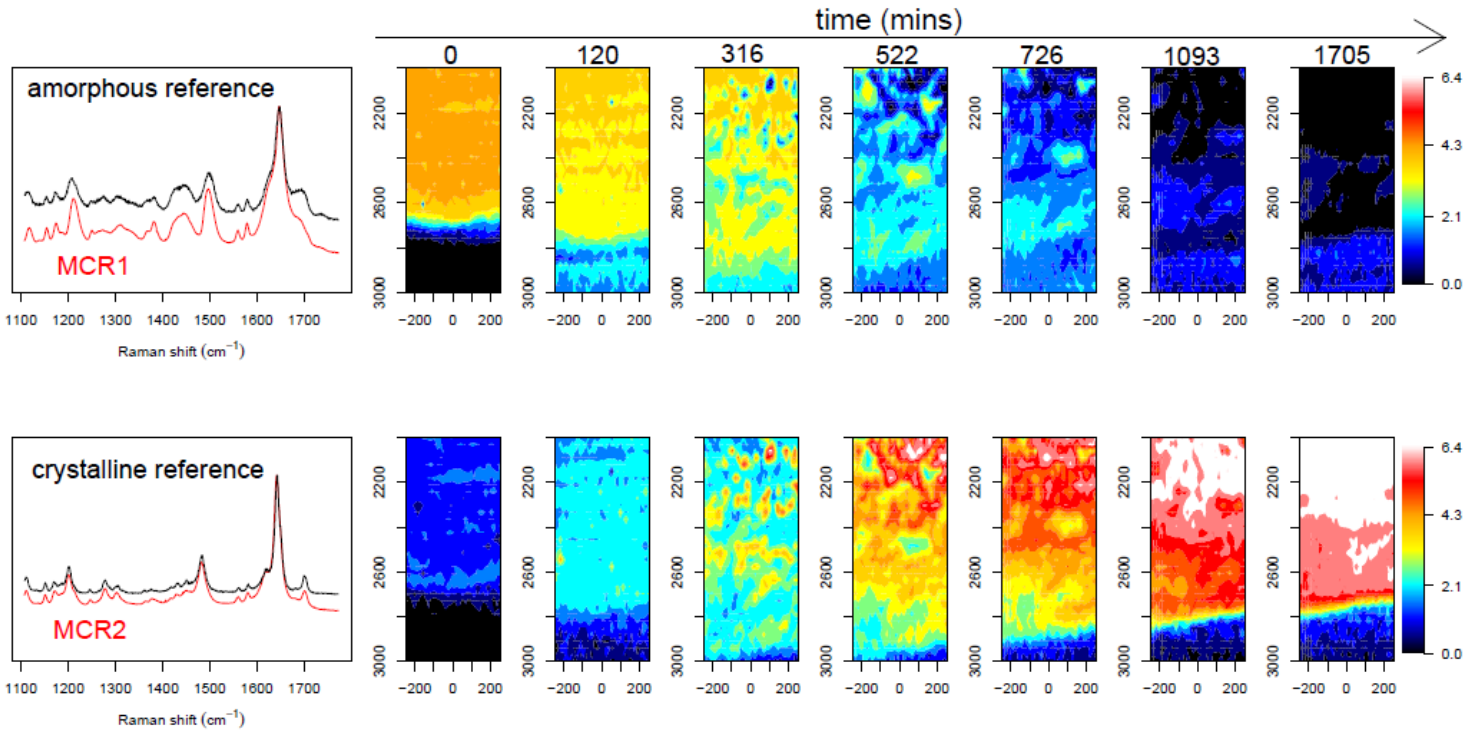
## Research Case Study

- 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.

# Summary

## Research Case Study

- 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:
  - **Low drug loadings** – the drug and polymer dissolve as a single entity.
  - **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.

# Further Information

Research Case Study

For further information on how Raman spectroscopy, or the Nottingham Nanotechnology and Nanoscience Centre could help with your applications, systems and designs please contact: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**For more details on the work showcased in this case study see the following publications:**


**F. Tres, K. Treacher, J. Booth, L.P. Hughes, S.A.C. Wren, J.W. Aylott and J.C. Burley. Real time Raman imaging to understand dissolution performance of amorphous solid dispersions.** ***J. Controlled Release, 2014, DOI:10.1016/j.jconrel.2014.05.061***


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