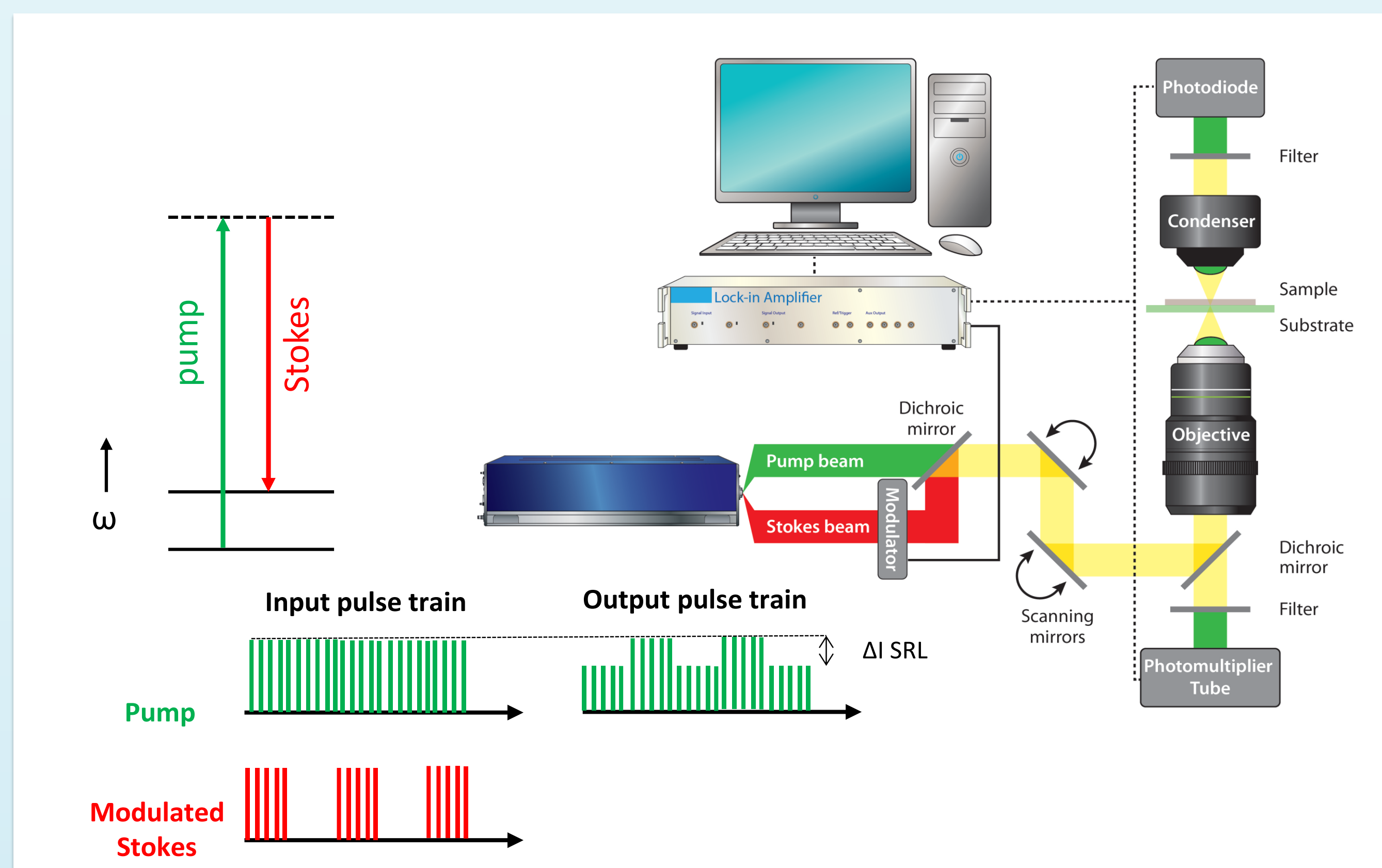


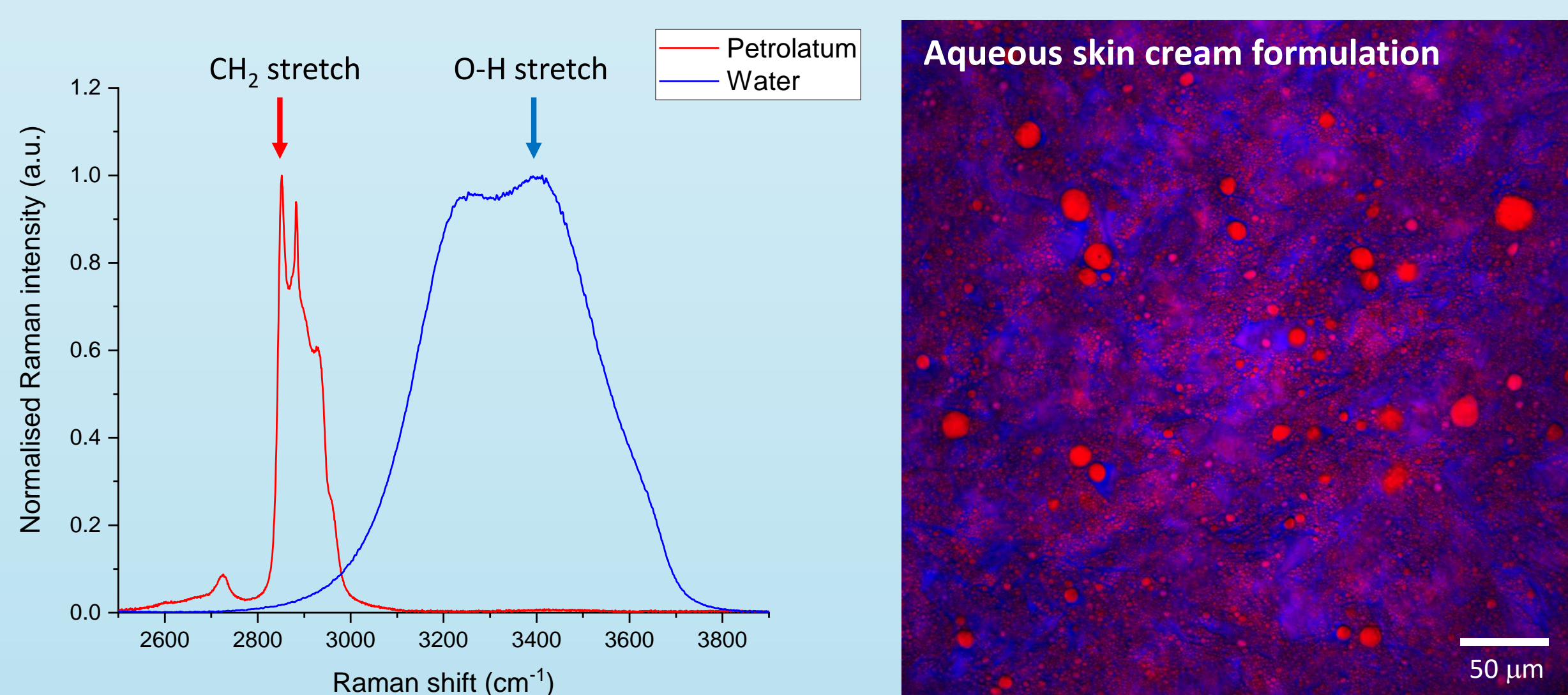
Introduction

Stimulated Raman scattering (SRS) microscopy is a valuable tool to assess formulated products. High resolution 3D chemical images can be acquired in 'real time' to reveal ingredient (co-)localization, crystalline phase, impurities and more. In addition, ingredients can be monitored post-application to the skin, to reveal mechanistic information such as penetration pathway and direct visualisation of metamorphosis^{1,2}. Due to their non-destructive nature, they can also be performed in tandem with other methods.

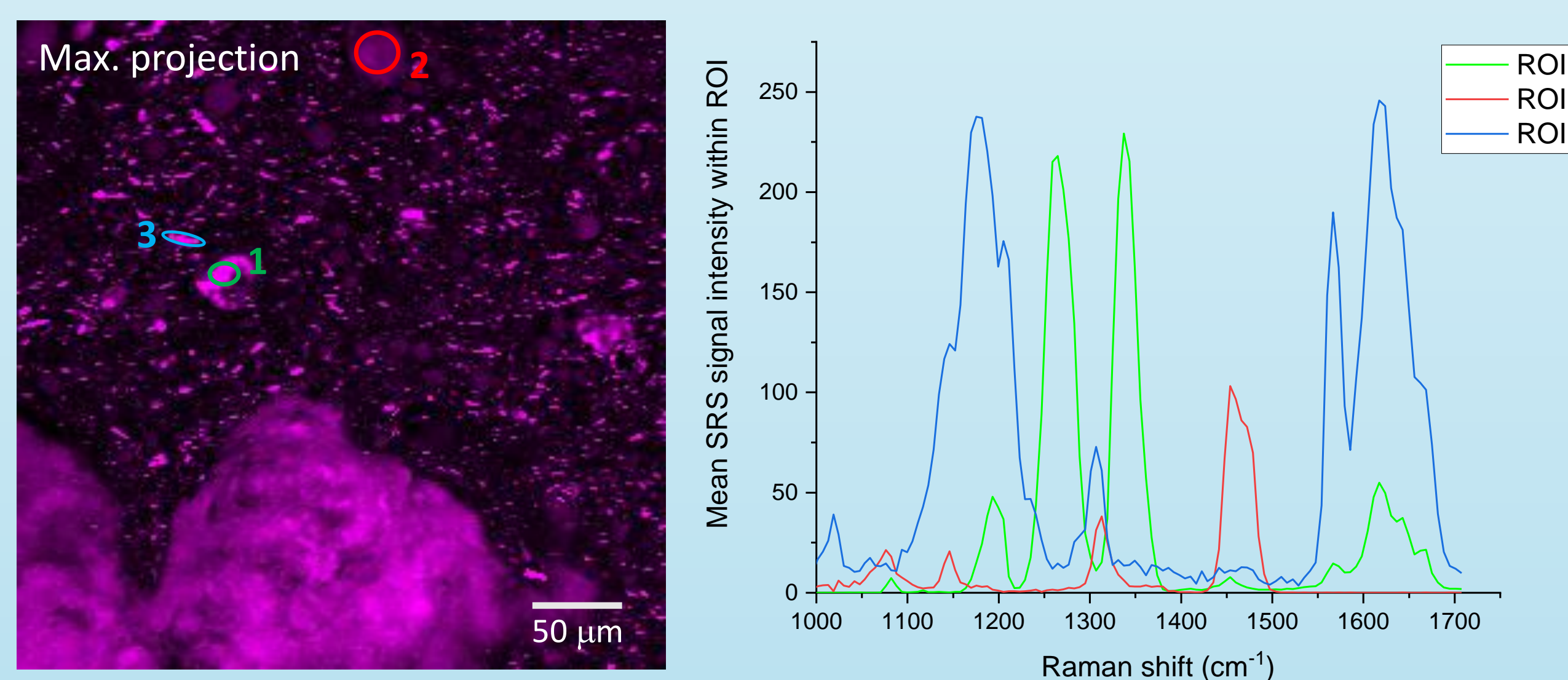


SRS microscopy example data

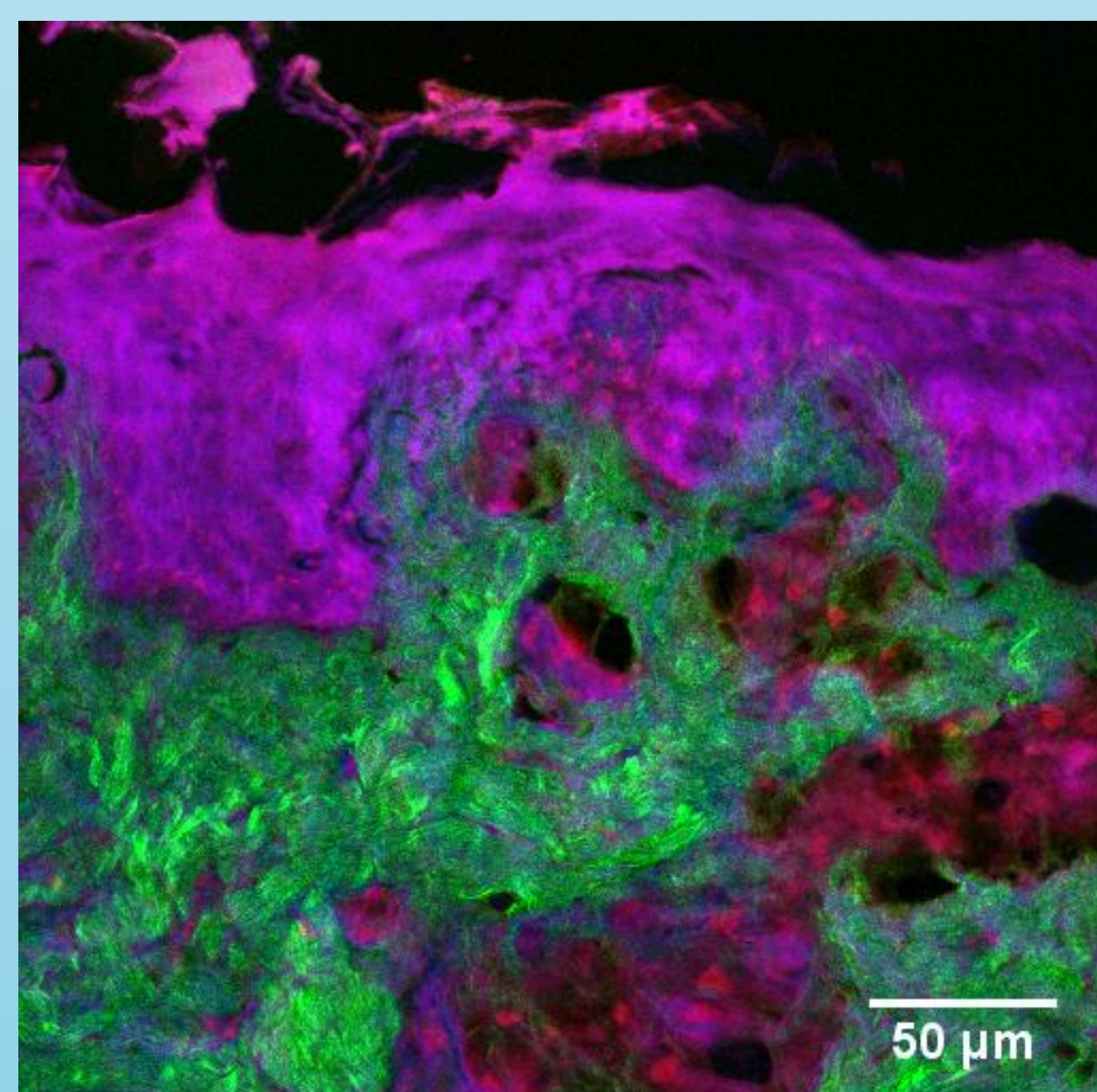
Confocal Raman spectra to inform SRS imaging:



SRS imaging to generate SRS spectra for feature ID:

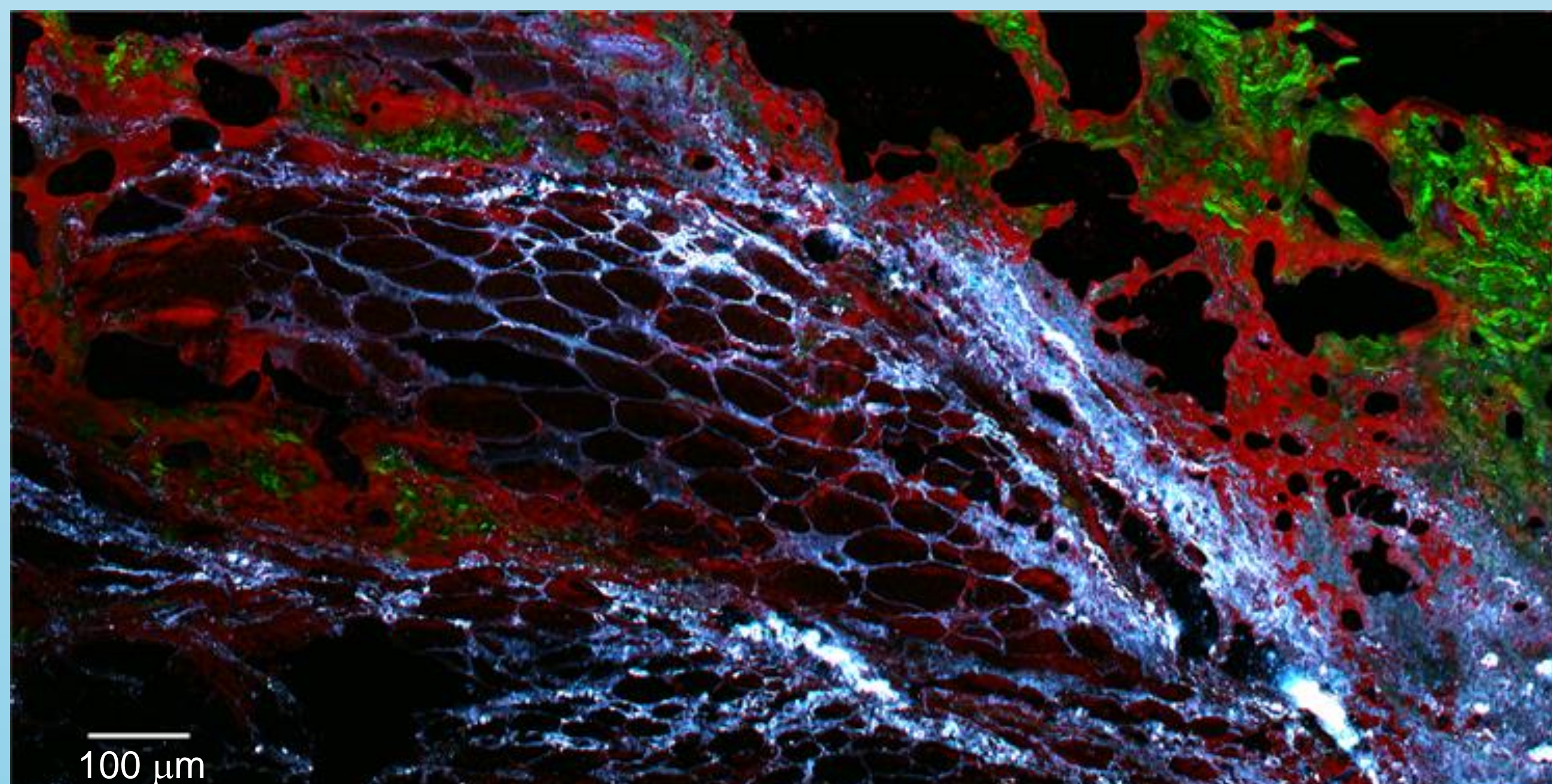


Drug permeation in skin



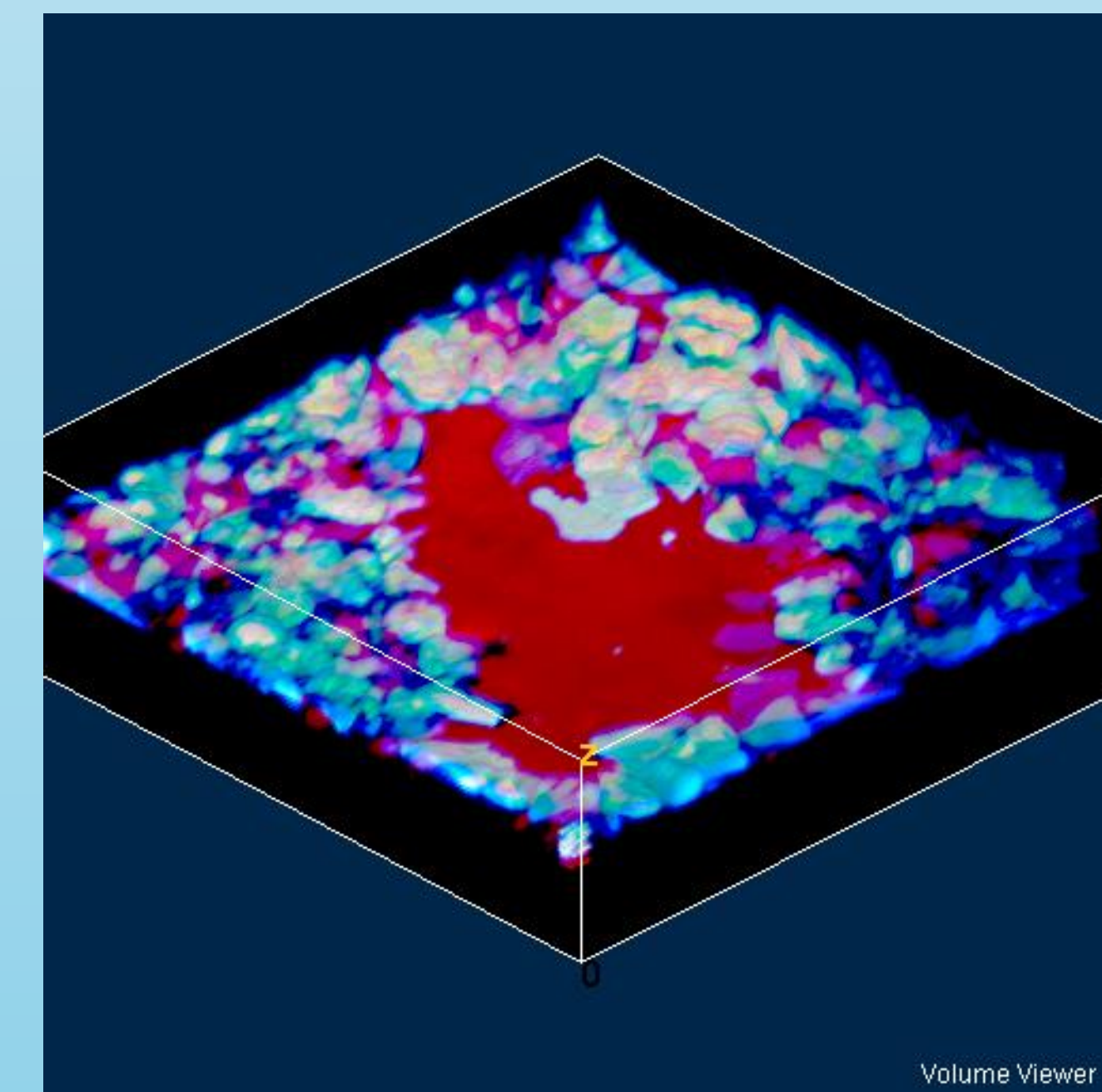
Drug CH₂ Amide I Collagen

Metallic particles in skin



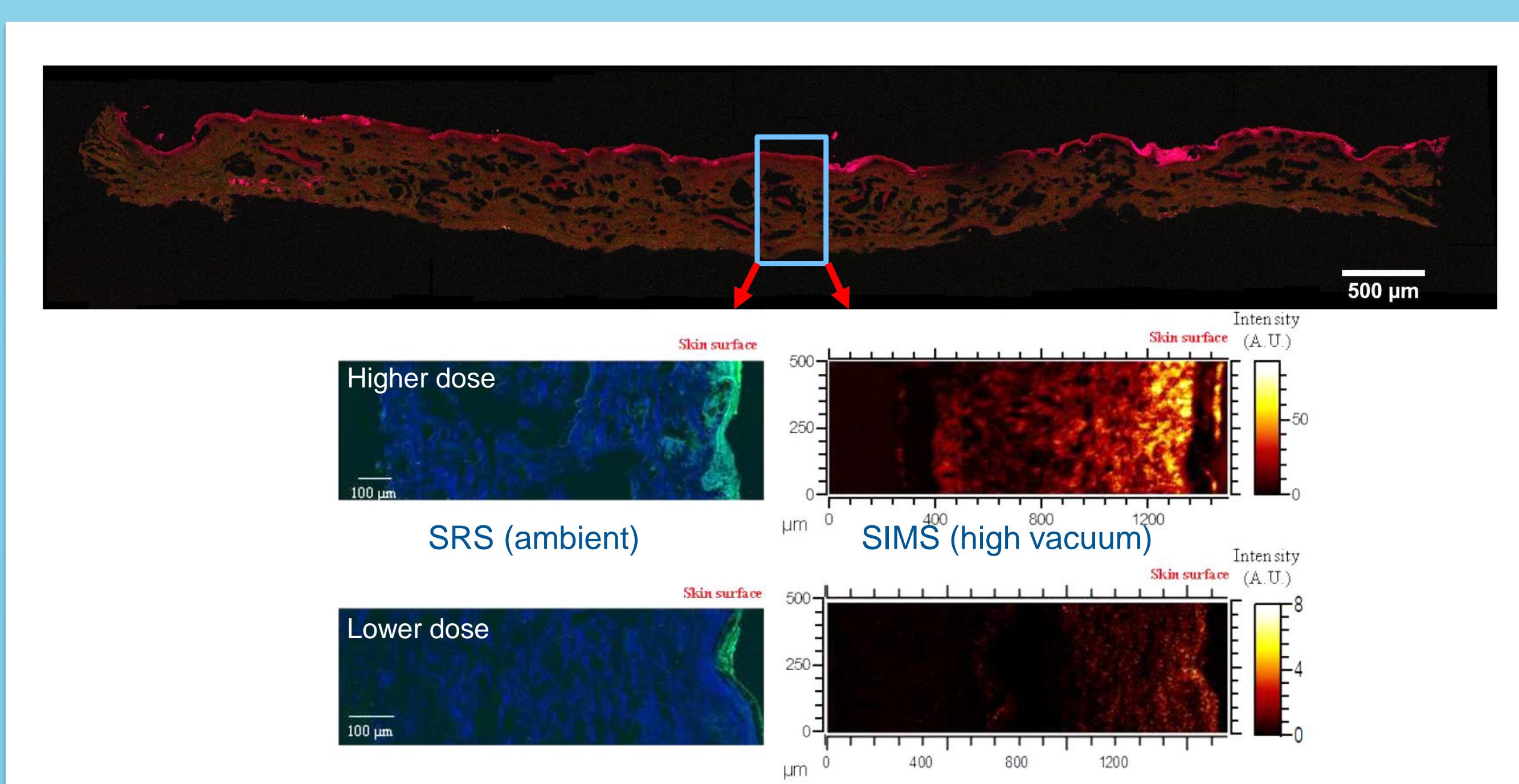
CH₂ Collagen off resonance (photothermal lensing for metallic particles)

Drug crystallisation on skin



CH₂ Drug

Correlative imaging with SIMS



Summary

- Label-free spectroscopic imaging can provide valuable insight to the chemical and structural properties of formulations, and their penetration into the skin, revealing new mechanistic insight and providing a new tool for product development 'troubleshooting'.
- Optical spectroscopy can be performed correlatively with other optical modalities including mass spectrometry imaging, which provides complementary information.

References

- B. G. Saar et al, Molecular Pharmaceutics, 8, (2011) 969-975
- N. A. Belsey et al, Journal of Controlled Release, 174 (2014) 37-42