Multimodal Confocal Microspectroscopy for the Characterisation of 2D Materials

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Following the groundbreaking discovery and isolation of graphene, researchers have persistently sought the next marvel in material science. Transition metal dichalcogenides have been the focus of extensive research, and more recently, MXenes are emerging into a field of their own.

Raman spectroscopy is a powerful and widely used technique for the characterisation of graphene and other 2D materials. When analyzing graphene Raman imaging is used to determine properties such as layer number and assess the quality of the sample. For example, Raman spectra will identify regions of strain, defects, and dopants.

As well as characterizing well-known materials, Raman microscopy is also fantastic for analyzing emerging materials. Understanding their fundamental properties is crucial for wider acceptance of 2D materials, and Raman spectroscopy being a fast and nondestructive tool becomes particularly advantageous as the MXene family grows.

In this work, we present a multimodal imaging platform that goes beyond Raman microscopy by combining several techniques to analyse existing and emerging 2D materials. For example, optical widefield, Raman, photoluminescence, photoluminescence lifetime and second harmonic generation imaging, offering a comprehensive approach to 2D materials characterisation.