Multimodal Microscopy Characterisation of 2D Materials

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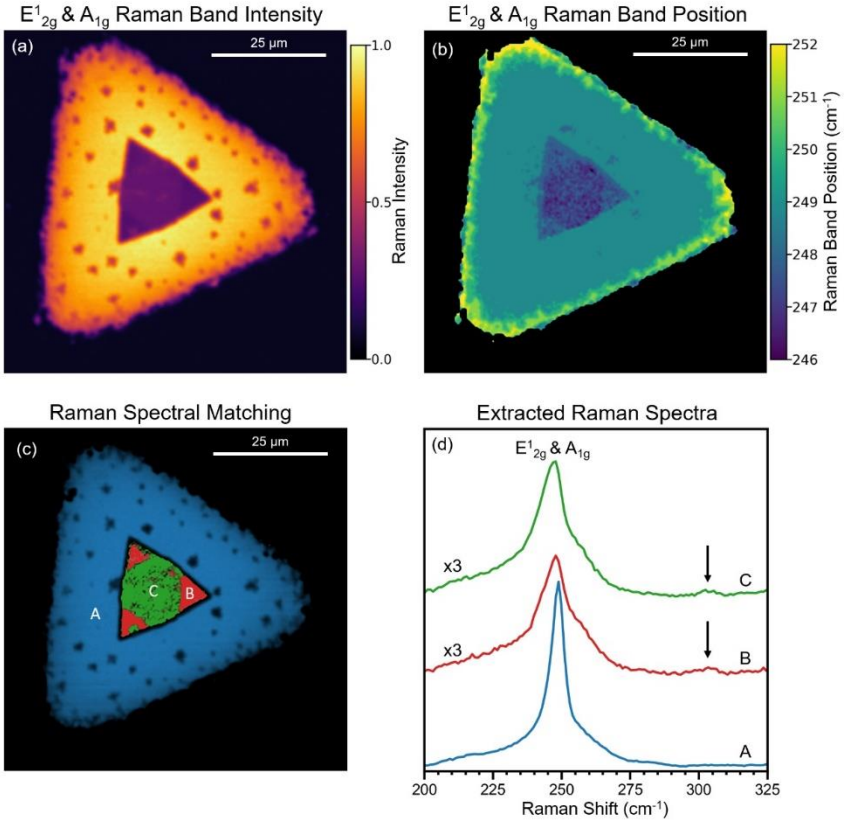
Spatial characterisation of transition metal dichalcogenides (TMDCs) is crucial for understanding their optoelectronic properties and optimising film growth conditions. In this work, we present a multimodal microscopy platform combining conventional widefield, Raman, photoluminescence and second harmonic generation imaging for the characterisation of 2D materials.

The platform was used to characterise CVD grown WSe2 crystals. Raman imaging identified the presence of both monolayer and multilayer WSe2 through a change in the intensity and position of the E12g / A1g phonon modes. Photoluminescence imaging confirmed the presence of monolayer WSe2 with emission at 780 nm and identified two distinct multilayer regions through changes in the photoluminescence wavelength and intensity. Lastly, second harmonic generation imaging under femtosecond laser excitation was used to obtain the relative growth orientation of the three identified domains in the crystal.

Figures



Raman imaging of WSe2. (a) Intensity of the E12g / A1g (250 cm-1) Raman band, (b) Peak position of the E12g / A1g (250 cm-1) Raman band, (c) least squares spectral matching revealing three distinct Raman spectral areas, (d) Averaged Raman spectra from areas A, B and C.