Macro, micro and nano-Raman spectroscopy in 2D systems: fundamentals and applications

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Raman spectroscopy has been largely used to quantify defects in graphene and other two-dimensional (2D) materials. Here we discuss how Raman spectroscopy can be used to disentangle the information from one-dimensional (1D) and zero dimensional (0D) defects in 2D materials (see Figure 1) [1]. The procedure has been parameterized for graphene using well-controlled reference materials with only 0D [2] or 1D defects [3].
We develop our analysis for the case of tip enhanced Raman spectroscopy (TERS), where we achieve characterization with nanometer resolution (see Figure 2). We compare a massive amount of data obtained with macro, micro and nano-Raman characterization for a comparative analysis.

References

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Figures

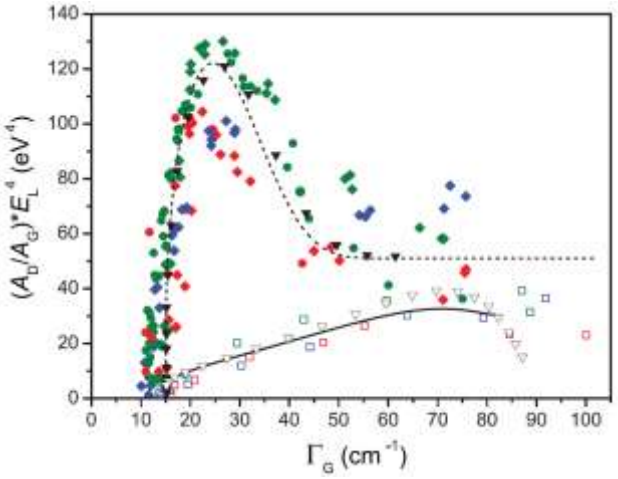

Figure 1: Raman phase diagram for defect characterization of graphene according to defect dimensionality. Solid and dashed lines are for samples with pure 1D and 0D defects, respectively. Data points are experimental results with reference materials. See Ref.[1] and references therein.

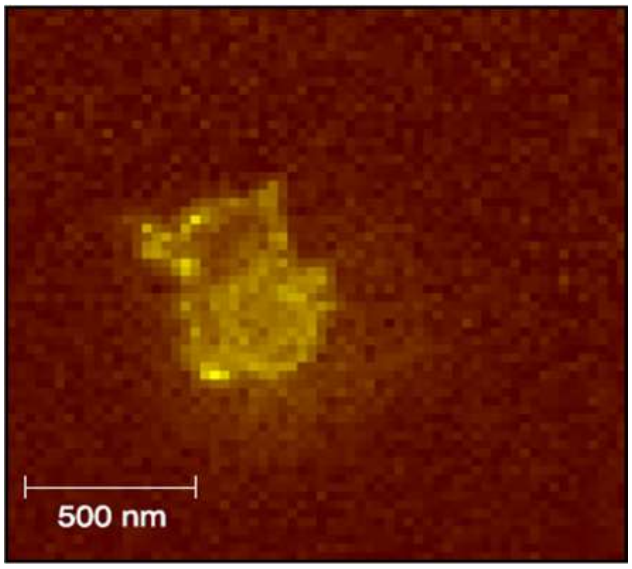

Figure 2: Tip enhanced Raman spectroscopy image of a graphene flake, based on the spectral D band intensity [4].