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Understanding 2D Materials with 4D Scanning Transmission Electron Microscopy

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Abstract:

One decade after the discovery of graphene, scientific research on two-dimensional (2D) materials is far from being exhausted. Because of their inherent atomic thickness, 2D materials can be conveniently studied by transmission electron microscopy (TEM), which nowadays allows their characterization on the atomic scale.

In my presentation, I will explore the possibilities of scanning transmission electron microscopy (STEM) beyond traditional imaging, based on a four-dimensional microscopy approach. This technique is employed to extract information from 2D materials that could not be accessed by conventional imaging. In particular, two studies will be presented. First, I will discuss the possibility of identifying 12C and 13C carbon isotopes on the atomic scale in a 13C-enriched graphene sample, and I will present the first experimental steps in this direction. Next, I will show how the three-dimensional atomic structure of a suspended hexagonal boron nitride/graphene van der Waals crystal was determined.