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IT-5-P-2998 STEM EELS Analysis of 2D Layered Inorganic Materials at Atomic Resolution

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In recent years, methods for dispersion and exfoliation of 2D nanostructures of a range of nanomaterials have been successfully developed [1-8], opening up numerous possibilities for a range of innovative technologies [4, 6-10]. Chemical and physical properties of materials can however change when going from bulk material to the 2D state. To make real applications feasible there is a need to fully characterize these nanostructures at an atomic scale. Due to the recent advances in transmission electron microscopy (TEM), scanning TEM (STEM) imaging and STEM electron energy-loss spectroscopy (EELS) can now be used to study the structure and composition of nanomaterials, atom by atom [11]. The focus of the study presented will be on characterization of inorganic 2D layered materials produced by liquid phase exfoliation [3,4], a high-yield method for producing sheets of few atomic layers thickness for a range of materials. Atomic resolution STEM EELS analysis of these sheets allows the determination of the atomic structure, structural defects as well as electronic properties of the material, giving insight into their fundamental physical and chemical properties.

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