

Physical, information & Engineering Sciences category

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“For his research on the synthesis of two-dimensional materials”

Shrinking bulk materials into one-atom-thickness films, so called two-dimensional (2D) materials, will trigger fascinating physical properties, as exemplified in graphene. Over a thousand 2D materials have so far been predicted, and they are promising candidates for a wide spectrum of applications - from electronics, optics and catalysis to energy. However, only a small selection of these has been synthesised so far.

Being a pioneer in the synthesis of 2D materials, Dr Liu has synthesized a variety of 2D materials, including hexagonal boron nitride (h-BN), transitional metal dichalcogenides (TMDs), III-VI families, alloys and heterostructures since he joined NTU Singapore. More recently, his research group demonstrated a universal method for the synthesis TMDs. Using this method, they synthesized more than 40 atom-thin TMD compounds and revealed their growth mechanisms. His work has attracted tremendous attention and is significantly strengthening Singapore's capability in the production of 2D materials.

Based on the 2D materials, Dr Liu studied their interesting physical phenomena such as charge density wave and 2D superconductivity. He also explored the potential applications of 2D materials in electronics, such as for high-mobility field-effect transistor, broadband mid-infrared detector. and non-volatile programmable p-n junctions.

To date, Dr Liu has co-authored over 170 papers, with citations exceeding 15,000 and has a h-index of 56. Among the papers, 22 are published in Nature and Science serials, and more than 60 are in top journals such as Advanced Materials, Nano Letter, ACS Nano, Journal of the American Chemical Society, and Physical Review Letters. He was in the final list of the World Technology Award in the Energy category (2012), a recipient of Nanyang Assistant Professorship (2013) at the Nanyang Technological University, and a Singapore National Research Foundation Fellowship Award (2013).