Luminescent nanomaterials derived from two-dimensional (2D) materials and their applications for energy storage and conversion.

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Atomic crystals of two-dimensional (2D) materials consisting of single sheets extracted from layered materials are gaining increasing attention. After the discovery of graphene, a vibrant research area on two-dimensional (2D) layered materials has emerged during the past decade. When the 2D materials are thinned down to few or monolayer, it possess extraordinary luminescent properties. Therefore, it is important to control the growth of 2D nanostructures in order to exploit their properties in energy conversion and storage applications. To date researchers trying to synthesis various morphologies to increase the performance of the device for the desired application.

MoS_2 attracted significant attention because of their rich electronic and photonic properties, the importance of fundamental research and novel device applications. In MoS_2 the layers are stacked by weak Vander Waals Force. It can undergo a transition from an indirect bandgap (~1.2 eV) in bulk crystals to a direct band gap (~1.9 eV) in monolayer nanosheets (~6.5 A°). Thus the tunable bandgap, electrocatalytic activity, high electron transport and large surface area in MoS_2 could enable the device application possible in energy harvesting, energy storage and in biomedical fields.

She is currently working on MoS_2 nanostructured materials which comes under the large family of layered transition metal dichalcogenide for energy applications. She is working on the 2D luminescent nanomaterials by top-down and bottom-up approach method to increase the number of active sites in MoS_2. The increasing active sites lead to the enhancing electrochemical, physiochemical, and optoelectronic properties in MoS_2. To determine the nanomaterials property dimensionality plays vital role. As a layered structured material MoS_2 exists in various dimension and can obtain the layers as thin as possible without affecting its stoichiometry. Thus, it providing so many opportunities for devices which include the development of new generation high-performance optoelectronic devices.

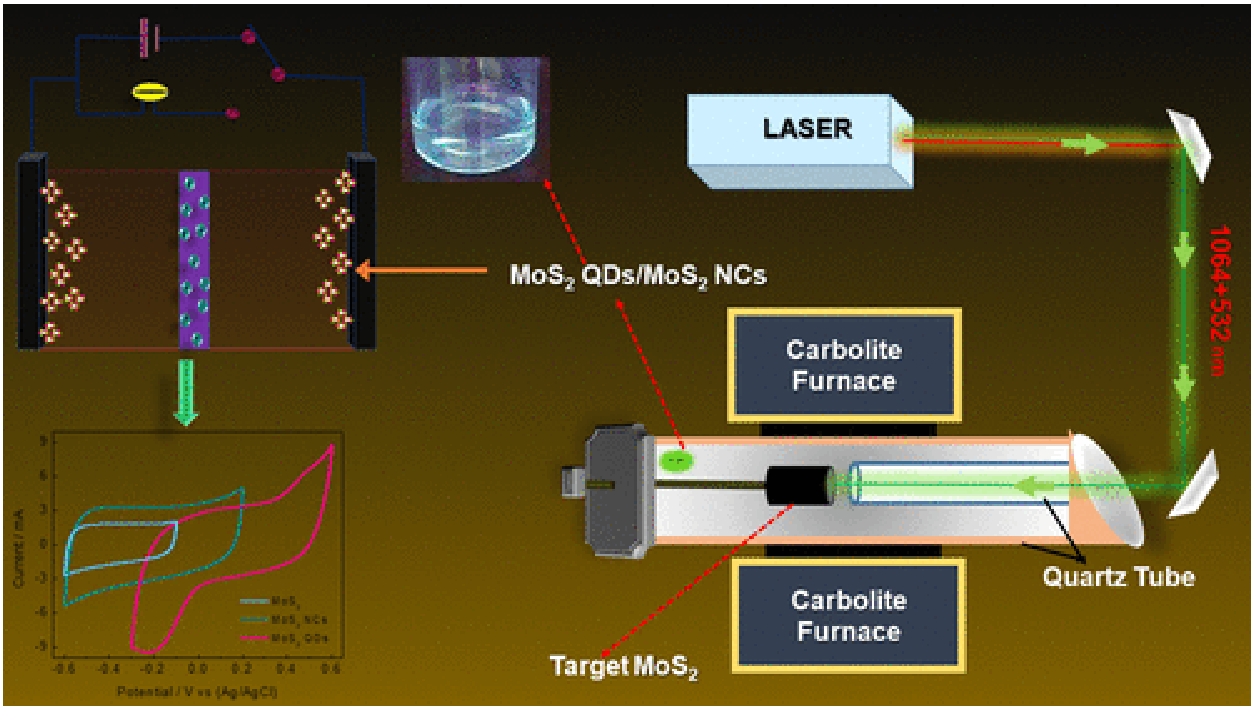

Figure 1: Schematic Diagram of Luminescent MoS_2 Quantum Dots with Tunable Operating Potential for Energy-Enhanced Aqueous Supercapacitors