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The metal to semiconductor transition in chemically exfoliated MoS_2 and application towards energy and catalysis.

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A fundamental understanding of the semiconductor to metal transition in exfoliated transition metal dichalcogenide (TMD), such as MoS_2 and WS_2, is relevant for many applications, ranging from electronic to energy production and storage. Nevertheless, present knowledge of this phase transition is marked by incertitude. Particularly, the microstructural phase evolution of the material after lithium intercalation and exfoliation is often debated due to challenges associated with resulting phase stability under energetic conditions. In this talk, we will describe atomic level characterizations of these phases, and progress being made towards controlling its evolution. Further, we will describe the impact of this structure-property relationship on conductivity, catalysis and hydrogen energy production.