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Sustainable Design of Multifunctional Nanomaterials for Innovative Water Treatment

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Abstract

Engineered nanomaterials have gained much attention in the last decade for environmental remediation and water treatment technologies due to their high surface area along with excellent adsorption, reactive, and catalytic properties. The recent focus of nano-enabled water treatment applications has shifted towards a new class of nanomaterials, called 'nanohybrids', that refers to a single nano-entity formed by the conjugation of two or more engineered nanomaterials. The motivation behind pursuing such hierarchical structures lies in the resulting enhancement or emergence of multifunctional physicochemical properties that enables improved efficiency for contaminant removal/degradation. However, these emerging properties of nanohybrids are quite different from their parent materials and hence, can lead to unprecedented environmental and human health risks – that are not predictable from prior studies of the singular materials. I will present my group's research efforts on the rational design of multifunctional carbon-metallic nanohybrids to elucidate their structure-property relationship for pollutant removal, while determining how and to what extent the hybridization alters their potential risk. Understanding the risk-benefit relationship will allow us to design safer multifunctional nanohybrids for innovative water treatment.