

## **Multifunctional Nanofibers and Nanofibrous Membranes for Environmental and Antibacterial Applications**

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### **Abstract**

Nanofibrous structures offer versatile platforms for functionalities and high surface area. In this presentation work, we demonstrate syntheses, characterizations and applications of multicomponent nanofibers and nanofibrous membranes for environmental and antibacterial applications. We first propose a conceptual design that involves three aspects of functional incorporation—in bulk, by compositions and on surface. This simple concept allows ones to examine endless possibilities for synthesizing multifunctional and multicomponent nanofibers from inorganic constituents such as metals and metal oxides. As examples, we show that photocatalytic TiO<sub>2</sub>, ZnO and WO<sub>3</sub> nanofibers can be simply fabricated via electrospinning and decorated with noble metals and paramagnetic nanoparticles. These hybrid nanofibers embodies great potential for air- and waterborne chemical mitigation under visible, UV or sunlight activation. However, the inherent brittleness of these metal oxide-based nanofibers poses challenges upon their future utilizations as membranes for any devices. As a consequent, we later innovates a new type of organic-inorganic hybrid nanofibrous membranes with multiple functions including potent antibacterial property. It is shown that the ultrathin, lightweight and permeable nanofibrous membranes could eliminate not only E. Coli but also tuberculosis bacteria. These mechanically robust and flexible nanomembranes could be fabricated into nanofilters for air treatment. Finally, these inventive multifunctional nanomembranes are expected to make extraordinary impact in solving global environmental and health problems.

**Keywords:** Nanofiber, Membrane, Nanospider, Noble Metal, Antibacterial.