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Hybrid Thin Film Nano-composite Membrane Reactors for Simultaneous Separation and Degradation of Pesticides

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Abstract:

Membrane reactors typically combine chemically reactive pathways with separation opportunities to increase conversion and chemical processes efficiency in liquid effluents treatment. The treatment of industrial bio-products, waste mixed solvents and agro-chemicals with such reactors are however challenging due to the natural affinity of such reactive materials for organic and biological matter leading to surface adsorption and fouling tendencies. Here, hybrid thin film composite catalytic membranes offering superior flow permeation characteristics, extremely high retention of low molecular weight organics and partial salt rejection capabilities were for the first time synthesized. Catalytic silver-metal nano-materials were for the first time homogeneously templated and encapsulated across metal organic frameworks nano-particles and incorporated across the top surface of poly(amide) thin films during interfacial polymerization. These novel materials offer high catalytic/anti-microbial behaviours due to the nano-structure of the metal nano-particles reduced within the metal organic framework template, forming unique hierarchical sub-100 nm hybrid nano-structures. These ultra-thin but yet dense membranes were able to simultaneously degrade chemicals and filter contaminants, opening new pathways for the design of the next generation thin film nano-composite membranes. Catalytic properties and

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