

MEMBRANE MATERIALS DEVELOPMENT

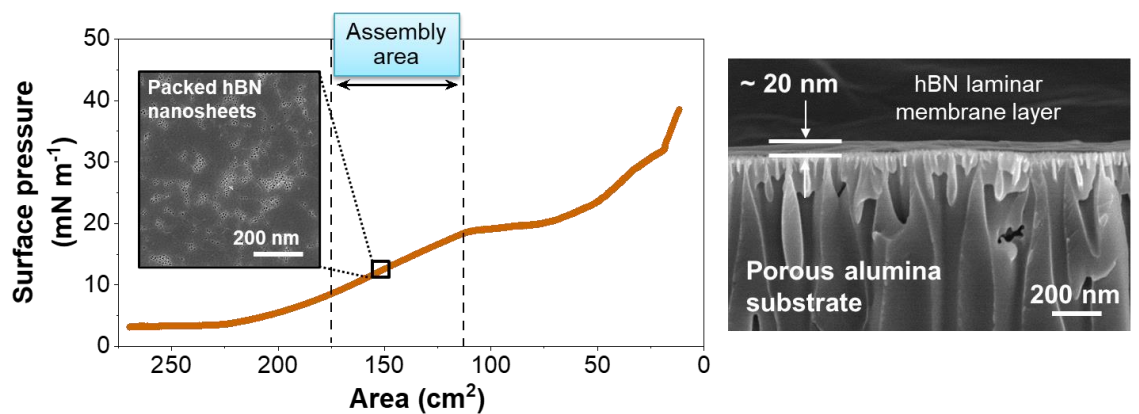
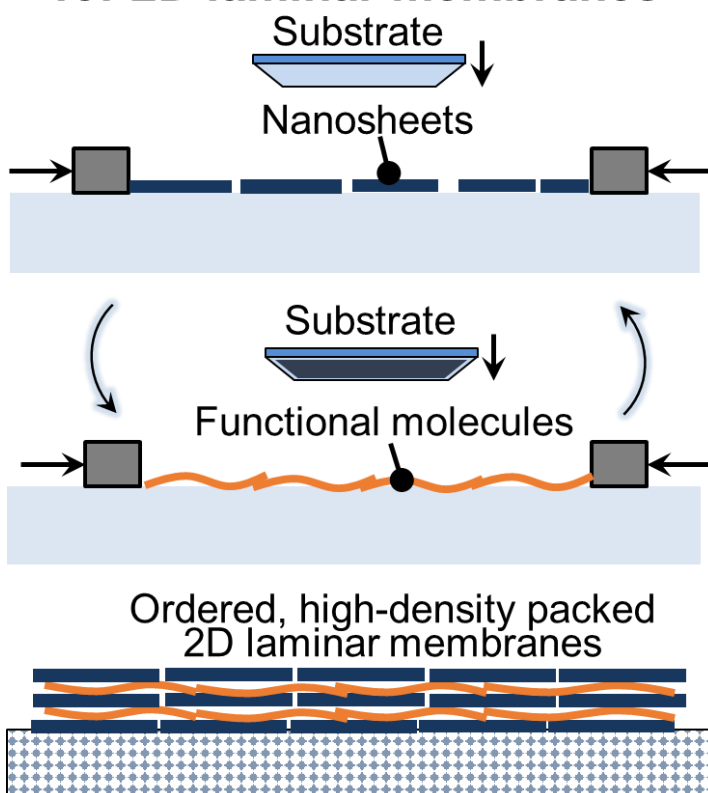
Ion-selective Sub-nanochannel Membranes for Efficient Recovery of Critical Divalent Metals from Waste Batteries

Abstract:

Battery recycling is essential for Singapore to reduce E-waste and recover valuable metals such as lithium, nickel and cobalt. Membrane technology offers a more energy-efficient and environmentally friendly approach compared to high-temperature pyrometallurgy and multi-step hydrometallurgy by improving metal ion separation after leaching.

However, existing membranes suffer from poor ion selectivity and limited chemical stability. This project aims to develop ultrathin defect-free 2D nanosheet membranes capable of selective divalent metal ion separation (such as Ni^{2+} , Co^{2+} , and Mn^{2+}) by gas–liquid interface assembly method. This strategy can enhance resource recovery and contribute to Singapore’s goals in sustainability and circular economy.

Layer-by-layer LB assembly for 2D laminar membranes



Gas–liquid interfacial assembly for the fabrication of highly ordered two-dimensional material channels with specific ion-binding sites for selective separation of divalent metal ions for waste battery recycling.



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