Large-scale Fabrication of MXene Nanofiltration Membrane With Exceptional Stability

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Large-scale fabrication of MXene films is highly demanded in various applications. Herein, we develop a slot-die coating method to fabricate large-area MXene membranes. The technique is continuous and scalable with a rapid coating speed of 6 mm s^{-1}. The thickness is controllable from the nanometer scale to the micrometer scale, and the shear force of the slot-die head can enhance the alignment of the nanosheet. The prepared membrane shows water permeance of 190 LMH/bar with a 269 Da of molecular weight cut-off, surpassing the previously reported performance of MXene-based membranes. The stability of the membrane can be verified by conducting filtration for 30 days under harsh oxidizing conditions, which is the longest operation ever achieved in the 2D material-based membrane. The observed membrane performance suggests its high potential for industrial and practical applications.