Pore Tuning of ZIF type MOF membrane for CO_2 separation enabled by graphene nanoribbon

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Tuning the pore structure and gas transport properties of the metal-organic framework has been mainly achieved by modifying framework building blocks. Herein, we suggest a direct growth of pore-tuned ZIF-8 layer on graphene oxide nanoribbons (GONR)-treated polymer substrate. Oxygen-containing groups and carbon dangling bonding of GONR not only enable spontaneous growth of ZIF-8 on the GONR surface but also enhance the rigidity by strongly anchoring the ZIF-8 layer via metal-carbon chemisorption. Gas permeation and molecular simulation results confirm that the effective aperture size of ZIF-8 is adjusted to 3.6 Å, and as a result, the membrane can be used for CO_2 separation in many applications. In addition, when the GONR is thermally treated to increase the portion of the sp^2 edge, the pore structure of ZIF-8 can be more rigid showing the intrinsic molecular weight cut-off at 3.4Å.