

Ultrafast and hydrogen selective nanoporous graphene membrane prepared by confined-pressure-annealing

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As the interests of hydrogen(H₂) purification from industry gas is growing, the H₂/CO₂ separation has been drawn attention more than before. Among various membrane materials of H₂/CO₂ separation, porous graphene oxide (GO) membrane is the most well-known for having high flux and selectivity because of their thin thickness and pore. However, porous GO membrane has the disadvantage of making it in large-scale. Herein, we demonstrate mass production method for manufacturing the porous GO membrane which has high selectivity and H₂ permeance. Membranes were prepared on porous polymer membrane by a bar coater. To control the d-spacing and the pore size, GO membrane was hot-pressed (150 °C, 13.33 kg/cm²) for 5 hours. The hot-pressed GO membrane had low d-spacing value (3.8 and 4.8 Å) by hot-press method, but H₂ permeance and H₂/CO₂ selectivity had increased due to pore was formed on GO layer. The hot-pressed GO membrane showed excellent separation performance with H₂/CO₂ selectivity of 12 ± 1.31 and H₂ permeance of 1.84 ± 0.5 x 10⁻⁶ mol m⁻² s⁻¹ Pa⁻¹.