Synthesis and gas transport properties of soluble copolyimide membranes using an alicyclic dianhydride

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CH4 has 21 times larger global warming potential than CO2 and has the 2nd largest contribution to global warming. Therefore, the upgrading of CH4 for vehicle fuels or gas grid injection is very important in terms of both prevention of global warming and security of renewable energy. The objective of this study is to develop good membrane materials with high CO2 permeability and high CO2/CH4 selectivity. We have successfully developed novel alicyclic dianhydride (DOCDA)-based polyimides (DOCDA-ODA) with excellent separation performances (1.7 barrers of CO2 permeability and 81 of CO2/CH4 selectivity) which are better than the commercialized membrane materials. To enhance the CO2/CH4 separation performance, we have synthesized three DOCDA-ODA based copolyimides with 20mol% of different dianhydrides (6FDA, BPDA and BTDA) using m-cresol as a solvent, respectively. All the synthesized copolyimides were characterized by NMR, FT-IR. The thermo mechanical properties analyzed with DSC and TGA. Then, thin dense membranes were prepared from the three copolyimides to check their gas permeation properties for N2, O2, CO2 and CH4 gased with a time-lag apparatus.