CO_2/CH_4 separation properties of alicyclic dianhydride based soluble polyimide membranes

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CH_4 is emitted from landfills or during anaerobic digestion of activated sludge, food wastes and animal wastes. CH_4 has 21 times larger global warming potential than CO_2 and has the 2nd largest contribution to global warming. The upgrading of CH_4 is very important in terms of both prevention of global warming and security of renewable energy for vehicle fuels or gas grid injection. Biogas can be efficiently upgraded by removing CO_2 and H_2S via membrane process. The performance of membrane process depends mainly upon CO_2/CH_4 selectivity and CO_2 permeability of membrane materials.

The objective of this study is to develop soluble polyimide membrane materials with high CO_2 permeability and high CO_2/CH_4 selectivity. We have developed novel alicyclic dianhydride (DOCDA)-based polyimides with different diamines (MDA, ODA and p-PDA) using m-cresol as a solvent, respectively. DOCDA-ODA showed excellent separation performances (6 barrers of CO_2 permeability and 64 of CO_2/CH_4 selectivity) which are much better than the commercialized membrane materials.