

# Pemisahan gas karbon dioksida dan metana melalui kontaktor membran serat berongga superhidrofobik menggunakan DEA dengan variasi laju alir gas dan jumlah serat membran = Separation of carbon dioxide and methane through superhydrophobic hollow fiber membrane contactor using DEA with the variation of gas flow and number of membrane fibers

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## Abstrak

[Gas alam sudah menjadi alternatif bahan bakar maupun digunakan sebagai bahan baku industri. Gas alam terdiri dari senyawa hidrokarbon berupa gas, seperti metana, etana, propana, butana, dan kondensat. Namun gas alam memiliki kandungan pengotor berupa air, nitrogen, karbon dioksida, hidrogen sulfida, dan merkuri yang harus dihilangkan. Teknologi kontaktor membran merupakan salah satu cara dalam menghilangkan kandungan karbon dioksida yang terdapat di dalam gas alam. Pada penelitian ini digunakan teknologi kontaktor membran serat berongga superhidrofobik dengan menggunakan pelarut DEA. Penelitian ini bertujuan untuk mengetahui persen penyerapan gas karbon dioksida dari pelarut DEA serta untuk mengetahui pengaruh laju alir gas umpan terhadap fenomena perpindahan massa yang terjadi di membran. Dari fenomena perpindahan massa yang terjadi, akan didapatkan kinerja dari kontaktor membran serat berongga superhidrofobik dalam proses absorpsi gas karbon dioksida. Berdasarkan penelitian yang dilakukan, jumlah gas karbon dioksida yang terserap sebesar 0,03128-0,05331 mmol/s untuk modul dengan jumlah serat 8000 dan untuk modul dengan jumlah serat 2000 mampu menyerap gas CO<sub>2</sub> sebesar 0,0268-0,02994 mmol/s. Nilai koefisien perpindahan massa yang didapatkan untuk modul dengan jumlah serat 2000 adalah sebesar  $1,93 \times 10^{-4}$ - $2,5 \times 10^{-4}$  cm/s dan modul dengan jumlah serat 8000 sebesar  $9,8 \times 10^{-5}$  -  $1,44 \times 10^{-4}$  cm/s untuk variasi laju alir gas sebesar 170, 255, dan 340 cm<sup>3</sup>/min dengan laju alir pelarut DEA yang tetap sebesar 500 cm<sup>3</sup>/min.

.....Natural gas has been used as alternative fuel or used as industrial raw materials. Natural gas consists of hydrocarbon compounds such as methane, ethane, propane, butane, dan condensats. However, natural gas also consists of impurities such as water, nitrogen, carbon dioxide, hydrogen sulfide, and mercury which have to remove. Membrane contactor technology is one of the methods which is used to remove carbon dioxide contents that contained in natural gas. In this study, we use hollow fiber membrane contactor using DEA as the solvent. The aim of this study is to know the absorption percentage of carbon dioxide and to know the effect of feed gas flow to mass transfer phenomenon which is occurred in membrane contactor. From the mass transfer phenomenon, we will obtain the performance of superhydrophobic hollow fiber membrane contactor in the absorption process. According to this study, the amount of carbon dioxide absorbed are about 0,03128-0,05331 mmol/s for the module with 8000 fibers and for the module with 2000 fibers able to absorb CO<sub>2</sub> about 0,0268-0,02994 mmol/s. The value of mass transfer coefficient which yang is obtained from the module with 2000 fibers are  $1,93 \times 10^{-4}$ - $2,5 \times 10^{-4}$  cm/s and for the module with 8000 fibers are  $9,8 \times 10^{-5}$ - $1,44 \times 10^{-4}$  cm/s for the variation of the feed gas flow: 170, 255, dan 340 cm<sup>3</sup>/min with the DEA constant flowrate about 500 cm<sup>3</sup>/min., Natural gas has been used as alternative fuel or used as industrial raw materials.

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