Supporting Information

CO_2-Responsive Membrane Separation Systems: A Green Solution for Efficient Separations

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Table of Contents

Table S1 Comparison of the performance of CO_2 responsive separation membrane with other stimulus-responsive separation membranes

Application	Stimuli-response type	Separation efficiency (%)	Flux (L m^{-2} h^{-1})	Ref.
Oil-water separation	pH	99.58	9600	[1]
	Thermo	98.5	9400	[2]
	Light	98.7	2352	[3]
	Electrical	99.88	2084	[4]
	CO_2	99.99	10000	[5]
Desalination	pH	94	1.17	[6]
	Thermo	97.5	55	[7]
	Light	94.6	10.5	[8]
	Electrical	98	120	[9]
	CO_2	66.8	62.61	[10]
Molecular separation	pH	69.3	1005.2	[11]
	Thermo	93.6	95.6	[12]
	Light	＞99	94.8	[13]
	Electrical	94	14.6	[14]
	CO_2	98	2100	[15]

Table S2 Comparison of the performance of CO_2-responsive draw solution with other responsive draw solutions

Application	Stimuli-response type	Reverse flux (G m^{-2} h^{-1})	Flux (L m^{-2} h^{-1})	Ref.
Draw solution	pH	0.06	2.22	[16]
	Thermo	0.37	10.7	[17]
	Magnetic	1.5	12.8	[18]
	CO_2	0	89	[19]

Table S3 Comparison of the advantages and disadvantages of different stimuli-response types

Stimuli-response type	Advantages	Disadvantages	Ref.
pH	• Applicability under extreme pH conditions	• Complex and costly design; • Limited by conditions (acid/base) and not mild	[1,6,11,16,20]
Thermo	• Without external additives; • exhibits high temperature sensitivity	• Adjustable temperature range is limited; • Coupling with the heating system increases costs and energy consumption; • Repeated heating-cooling cycles are prone to cause material degradation	[2,7,12,17,20]
Electrical	• Switching time is short (at the second level)	• The need for continuous power supply increases costs; • Potential for membrane fouling or degradation due to electrical effects	[4,9,14,20]
Light	• Rapid response and control	• Require lighting equipment	[3,8,13,20]
CO_2	• The conditions are mild and pollution-free; • No by-products are produced; • It can be reused repeatedly; • The gas cost is low	• The response time is limited by the gas solubility and diffusion rate	[5,10,15,19,20]

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