Supplementary information for

Tuning CO_2 reaction enthalpy *via* metal complexes for advanced amine technology

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Figure S2. Rich split configuration of CO_2 desorption process to recover the latent heat.

Table S1. Chemical reactions and their equilibrium constants in Ni(II)-MEA-CO_2-H_2O system.

MEA-CO_2-H_2O reaction [a]					
No.	**Reactions**	**Equilibrium Constant** $lnK = A + \frac{B}{T} + ClnT + DT$			
		A	**B**	**C**	**D**
R1		170.7	-8477.7	21.9	0.005781
R2	$\leftrightarrow H^+ + HCO_3^-$	231.46	-12092.1	-36.8	0
R3	$HCO_3^- \leftrightarrow H^+ + CO_3^{2-}$	216.0	-12431.7	-35.5	0
R4	$MEA + H^+ \leftrightarrow MEAH^+$	1974.4	-7.5	56.0	0
R5	$MEACOO^- + H_2O \leftrightarrow MEA + HCO_3^-$	47.7	-1.67	-13.07	0.0651

Ni-MEA complexation [b]			
	Reactions	**Equilibrium Constant** lgK	ΔH, kJ/mol
R6	$Ni^{2+} + MEA \leftrightarrow Ni(MEA)^{2+}$	3.12	-14
R7	$Ni^{2+} + 2MEA \leftrightarrow Ni(MEA)_2^{2+}$	5.60	-30
R8	$Ni^{2+} + 3MEA \leftrightarrow Ni(MEA)_3^{2+}$	7.30	-41

Note: [a] Equilibrium constants are from Kim et al[22]; [b] stability constants and enthalpies are from NIST Data Gateway[23].

Table S2 CO_2 loading performance in CO_2 absorption-desorption experiments in 2M MEA solution

	CO_2 loading			
Ni(II) concentration	Ni/MEA=0	Ni/MEA=0.05	Ni/MEA=0.10	Ni/MEA=0.15
CO_2 absorption at 25 °C	0.53	0.51	0.46	0.41
CO_2 desorption at 40 °C	0.47	0.47	0.36	0.30
CO_2 desorption at 60 °C	0.33	0.32	0.25	0.21
CO_2 desorption at 80 °C	0.26	0.22	0.20	0.15
Cyclic loading between 25°C and 40 °C	0.06	0.04	0.15	0.16
Cyclic loading between 25°C and 60 °C	0.20	0.19	0.21	0.20
Cyclic loading between 25°C and 80 °C	0.27	0.29	0.26	0.26

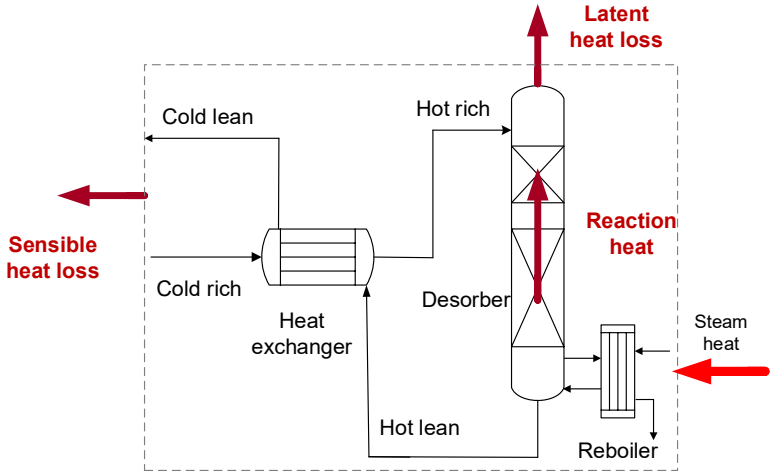

Figure S1. Desorption system boundary to analyze the three components of regeneration duty including sensible heat, latent heat and reaction heat.

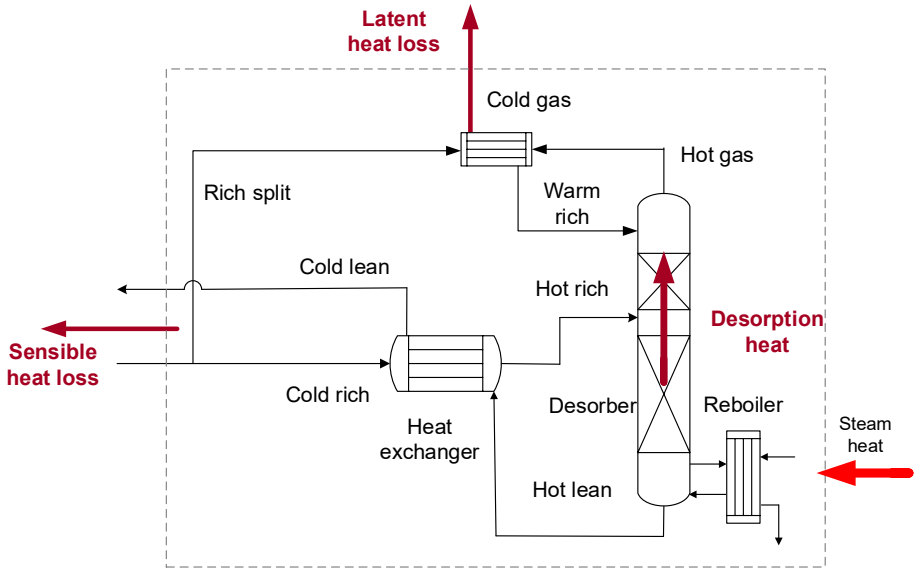

Figure S2. Rich split configuration of CO_2 desorption process to recover the latent heat.