Supplementary Information

A Generalized Methodology for the Development of Reactive Double Dividing-Wall Distillation Columns

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When the reactive system exhibits the SFRRV (i.e., $\alpha_A > \alpha_B > \alpha_C > \alpha_D$ or $\alpha_C > \alpha_D > \alpha_A > \alpha_B$), the derivation of the R-DDWDC must be illustrated according to the specific case: for the case of $\alpha_A > \alpha_B > \alpha_C > \alpha_D$, the derivation is presented in Figure S1(a); for the case of $\alpha_C > \alpha_D > \alpha_A > \alpha_B$, the derivation is shown in Figure S1(b).

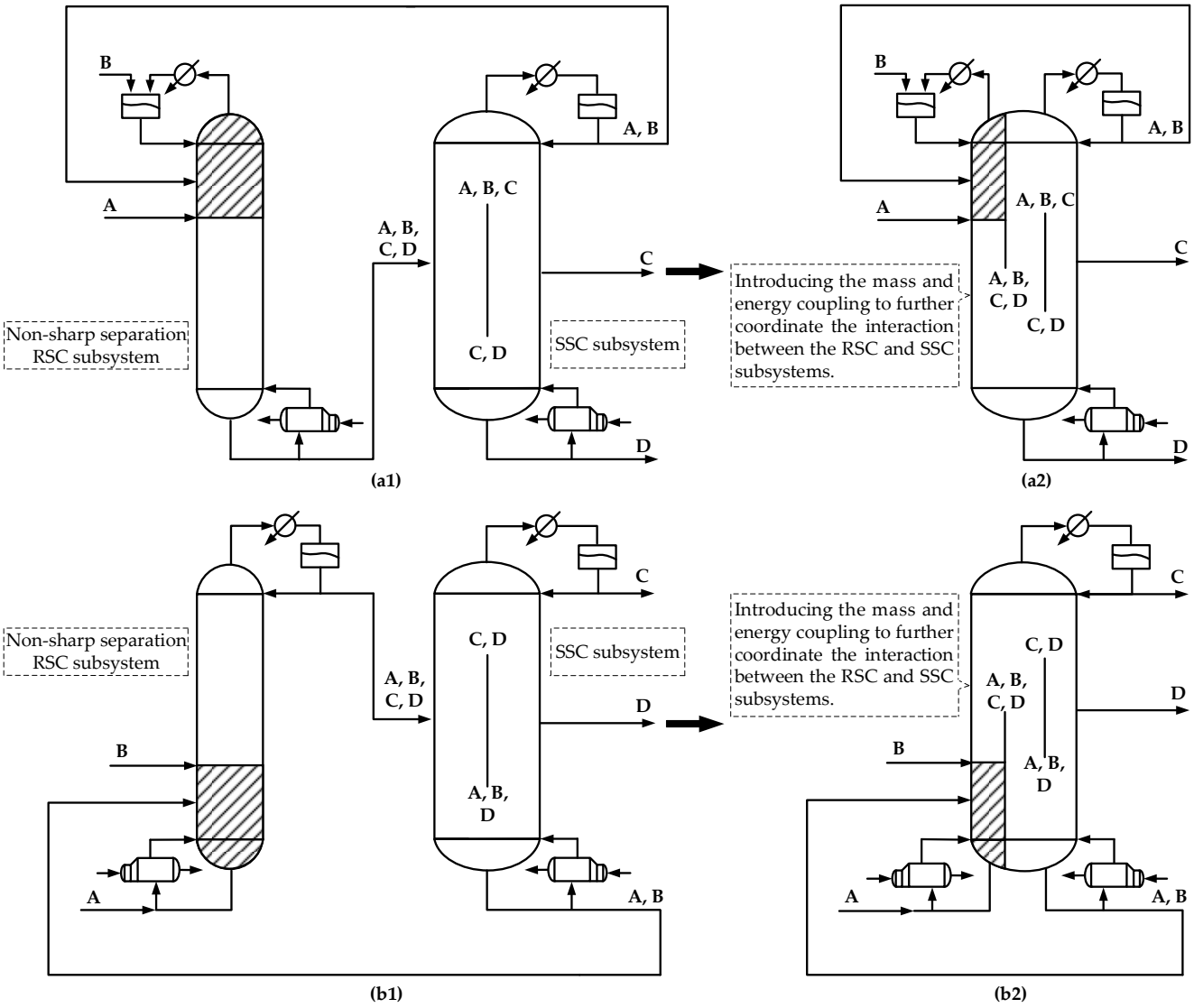
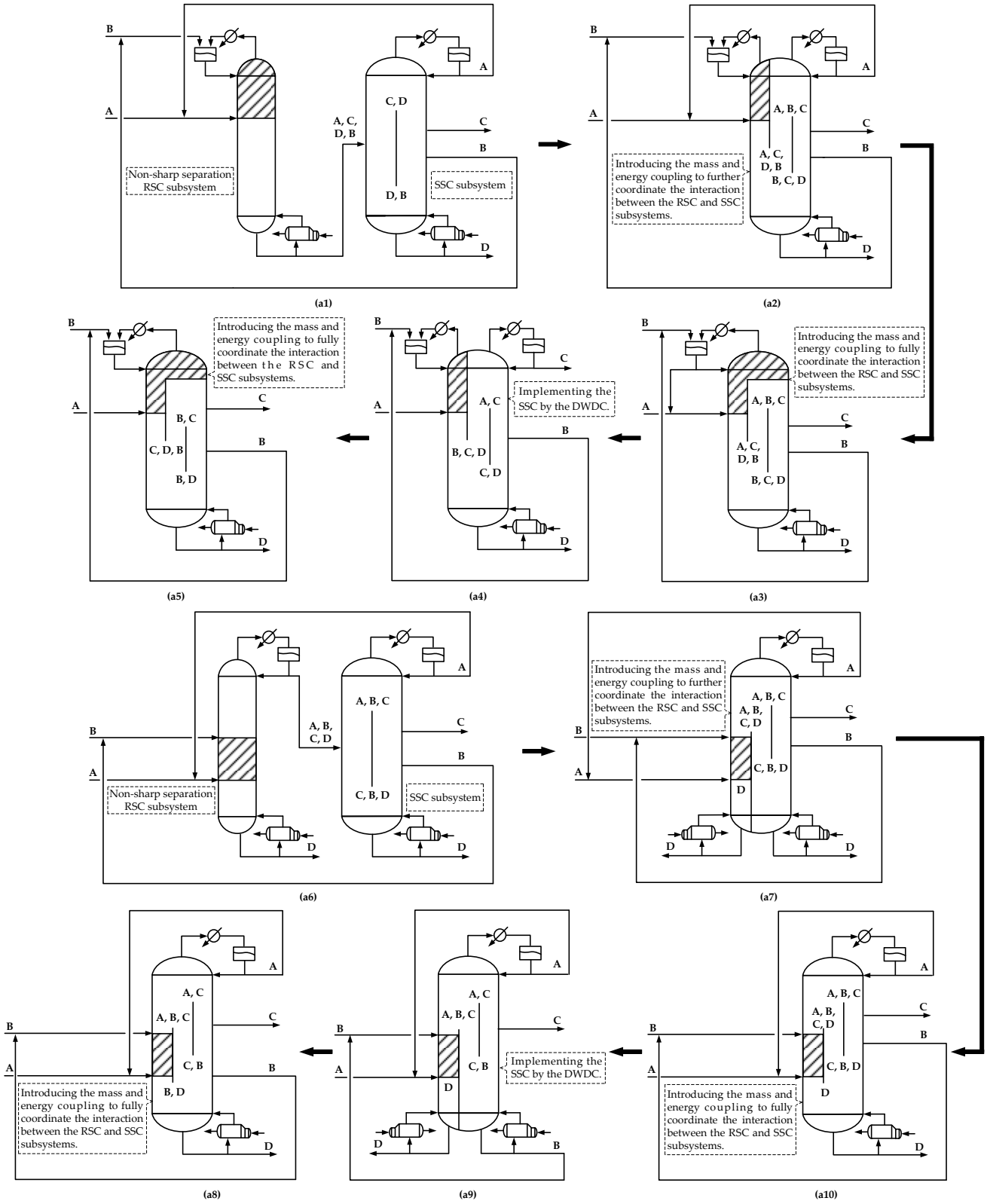


Figure S1. Derivation of the topological configuration of the R-DDWDC for A + B ↔ C + D with $\alpha_A > \alpha_B > \alpha_C > \alpha_D$ and $\alpha_C > \alpha_D > \alpha_A > \alpha_B$.

When the reactive system follows the SURRV (i.e., $\alpha_A > \alpha_C > \alpha_B > \alpha_D$ or $\alpha_C > \alpha_A > \alpha_D > \alpha_B$), the derivation of the R-DDWDC must be illustrated according to the specific case: for the case of $\alpha_A > \alpha_C > \alpha_B > \alpha_D$, the derivation is presented in Figure S2(a); for the case of $\alpha_C > \alpha_A > \alpha_D > \alpha_B$, the derivation is shown in Figure S2(b).


B
A
A, C, D, B
C, D
C
B
A
D, B
D
Non-sharp separation RSC subsystem
SSC subsystem
(a1)
A, B, C
A, C, D, B
B, C, D
Introducing the mass and energy coupling to further coordinate the interaction between the RSC and SSC subsystems.
(a2)
Introducing the mass and energy coupling to fully coordinate the interaction between the RSC and SSC subsystems.
(a3)
Implementing the SSC by the DWDC.
(a4)
Introducing the mass and energy coupling to fully coordinate the interaction between the RSC and SSC subsystems.
(a5)
A, B, C
A, B, C, D
C, B, D
(a6)
(a7)
(a8)
(a9)
(a10)

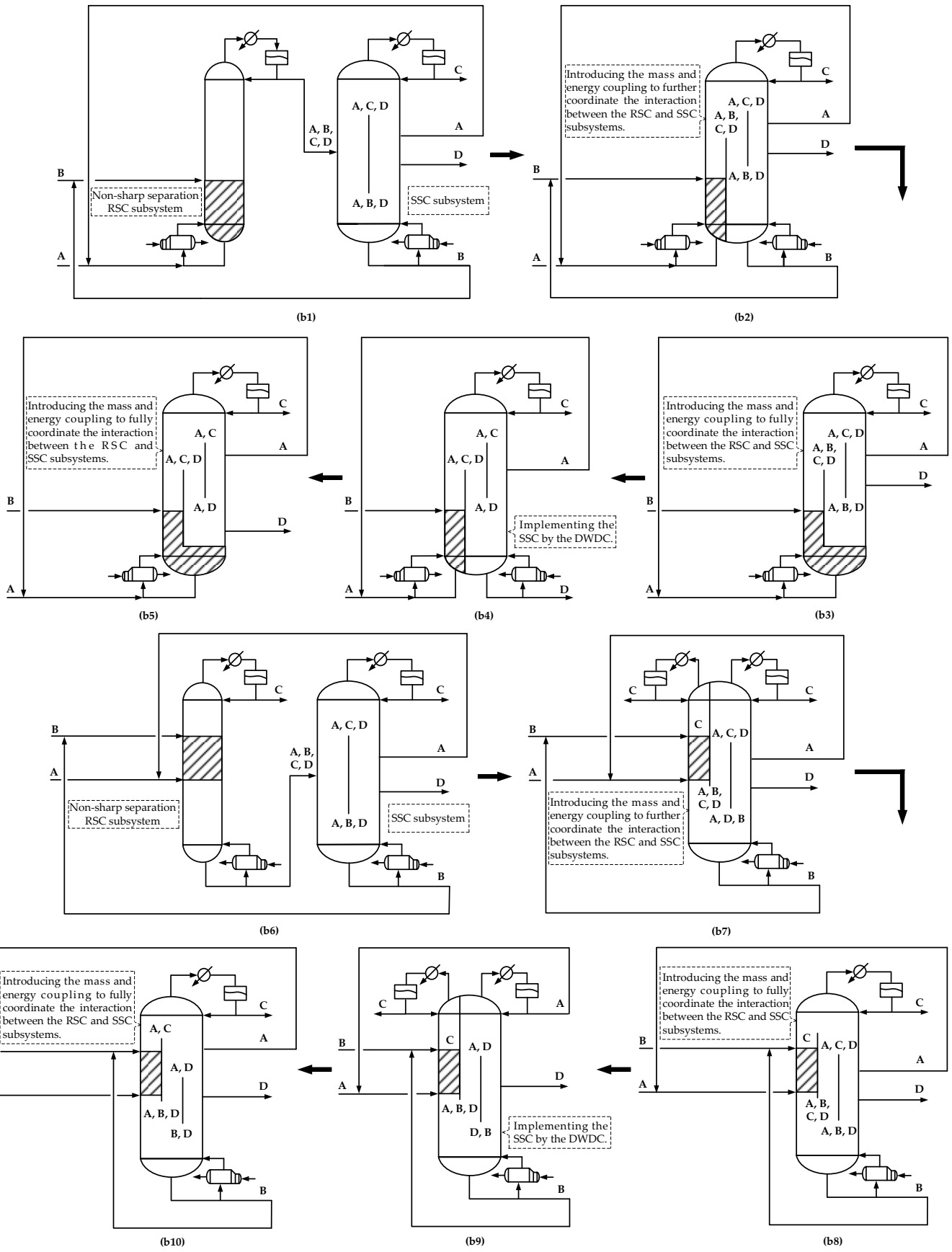


Figure S2. Derivation of the topological configuration of the R-DDWDC for A + B ↔ C + D with $\alpha_A > \alpha_C > \alpha_B > \alpha_D$ and $\alpha_C > \alpha_A > \alpha_D > \alpha_B$.

When the reactive system features the MURRV (i.e., $\alpha_A > \alpha_C > \alpha_D > \alpha_B$), the derivation of the R-DDWDC is illustrated in Figure S3.

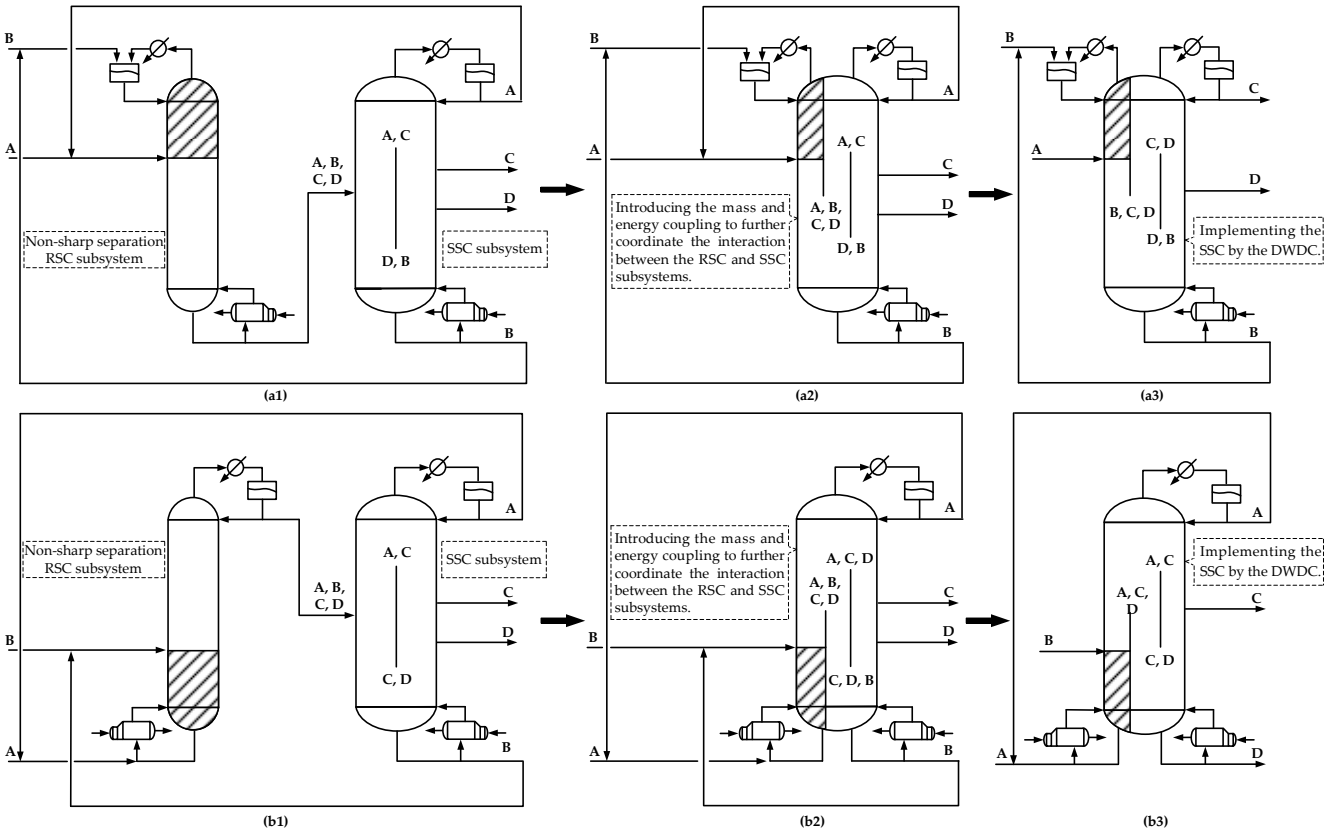


Figure S3. Derivation of the topological configuration of the R-DDWDC for A + B ↔ C + D with $\alpha_A > \alpha_C > \alpha_D > \alpha_B$.