Appendix S1: Empirical Relations for the Polymerization Rate (eqs A1-A4), the Overall Heat Transfer Coefficient (eqs A5-A8), and the Jacket Heat Transfer Area (eq A9)

$$R_p = ikm_M \tag{A1}$$

$$k = k_0 \exp(\frac{-E}{RT}) \cdot (k_1 \mu)^{k_2} \tag{A2}$$

$$\mu = c_0 \exp(c_1 f) \times 10^{c_2 (a_0 / T - c_3)} \tag{A3}$$

$$f = m_p / (m_M + m_p + m_C) \tag{A4}$$

$$U = \frac{1}{h^{-1} + h_f^{-1}} \tag{A5}$$

$$h = d_0 \exp(d_1 \mu_{wall}) \tag{A6}$$

$$\mu_{wall} = c_0 \exp(c_1 f) \times 10^{c_2 (a_0 / T_{wall} - c_3)} \tag{A7}$$

$$T_{wall} = (T + T_j) / 2 \tag{A8}$$

$$A = (\frac{m_M}{\rho_M} + \frac{m_P}{\rho_P} + \frac{m_W}{\rho_W}) \frac{P}{B_1} + B_2 \tag{A9}$$

Table S1. Parameter Values of the Reactor Model

parameter	unit	value
R	kJ kmol^{-1} K^{-1}	8.314
$(UA)_{loss}$	kW K^{-1}	0.00567567
τ_p	s	40.2
θ_1	s	22.8
θ_2	s	15.0
$\boldsymbol{i}$		[0.8, 1.2]
h_f^{-1}	m^2 K kW^{-1}	[0.000 0.176 0.352 0.528 0.704]
T_{amb}	K	305.382
T_{inlet}	K	294.26
T_{stream}	K	449.82

Table S2. Data of Polymer A

parameter	unit	value
$m_{M,0}$	kg	0.0
$m_{P,0}$	kg	11.227
m_W	kg	42.750
ρ_M	kg m^{-3}	900
ρ_P	kg m^{-3}	1040
ρ_W	kg m^{-3}	1000
$C_{p,M}$	kJ kg^{-1} K^{-1}	1.675
$C_{p,P}$	kJ kg^{-1} K^{-1}	3.140
$C_{p,W}$	kJ kg^{-1} K^{-1}	4.187
$C_{p,C}$	kJ kg^{-1} K^{-1}	4.187
MW_M	kg kmol^{-1}	104.0
m_C	kg	21.455
$\dot{m}_C$	kg s^{-1}	0.9412
k_0	s^{-1}	55
k_1	m s kg^{-1}	1000
k_2		0.4
ΔH	kJ kmol^{-1}	70152.16
E	kJ kmol^{-1}	29560.89
c_0	kg m^{-1} s^{-1}	0.000052
c_1		16.4
c_2		2.3
c_3		1.563
a_0	K	555.556
d_0	kW m^{-2} K^{-1}	0.814
d_1	m s kg^{-1}	-5.13
P	M	1.594
B_1	m^2	0.193
B_2	m^2	0.167