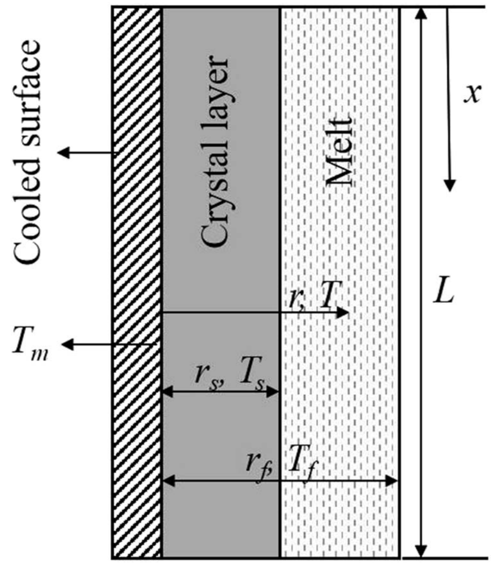

Figure 11.2 Schematic description of state variables in layer crystallization.

BC:

$$r = r_{\mathrm{f}},\ -D\frac{\partial C}{\partial r} = 0$$

$$r = r_{\mathrm{s}},\ -D\frac{\partial C}{\partial r} = -G = -k_{\mathrm{i}}\left(C_{\mathrm{r}} - C_{\mathrm{e}}\right)^{n}$$

where F is the flow rate of the melt, C_0 is the initial concentration, C_{melt} is the average concentration of product component at distance x, G is the crystal growth rate, k_{i} and n are the crystal growth parameters, C_{r} is the concentration at the crystal layer surface, C_{e} is the equilibrium concentration, and V_{tank} is the volume of feeding tank.

Similarly, the mass transfer equation for impurity in the melt could be written as:

$$\frac{\partial C_{\mathrm{imp}}}{\partial t} + u(r)\frac{\partial C_{\mathrm{imp}}}{\partial x} = D_{\mathrm{imp}}\frac{1}{r}\frac{\partial}{\partial r}\left(r\frac{\partial C_{\mathrm{imp}}}{\partial r}\right),\ r_{\mathrm{s}} \le r \le r_{\mathrm{f}},\ 0 \le x \le L \qquad (11.7)$$

IC:

$$t = 0,\ C_{\mathrm{imp}}(r,x,0) = C_{\mathrm{imp,\,0}}$$

$$x = 0,\ \frac{\mathrm{d}C_{\mathrm{imp}}(r,0,t)}{\mathrm{d}t} = \frac{F(L,t)\left(C_{\mathrm{imp,melt}}(L,t) - C_{\mathrm{imp,melt}}(0,t)\right)}{V_{\mathrm{tank}}}$$

BC:

$$r = r_{\mathrm{f}},\ -D_{\mathrm{imp}}\frac{\partial C_{\mathrm{imp}}}{\partial r} = 0$$