powder-free formulation techniques are utilized that require impurity-free solutions to make composite or specialized solid dosage formulations. In recent years, several powder-free formulation techniques have been developed that could enable powder-/slurry-free production of orally dosed tablets, such as crystallization (i) within cast polymer thin films,[265] (ii) within co-dissolved polymers using spray drying, electro-spraying, or electro-spinning,[266] (iii) on the surface of polymers,[136,138] and (iv) within hydrogels.[165,174,267,268]

Yazdanpanah *et al.*[264] demonstrated the capability of the so-called filtration avoidance approach that combines crystallization, filtration, drying, and dissolution in a single unit to avoid the transfer and isolation of solids. The basic concept is adapted from falling film melt layer crystallization.[222,223,225] The falling film solution layer crystallization involves the crystallization on a surface from a superheated thin liquid film of crude mother liquor flowing over the cooled surface (Figure 7.16). The solution quickly cools as it flows down the cold surface and becomes supersaturated leading to firstly nucleation followed by growth onto the nucleated layer. The residual solution is collected in a superheated section beneath where it can be recirculated to improve the yield. Once the crystal layer has been grown to the desired thickness or the mother liquor has reached equilibrium, the crude solution is removed from the

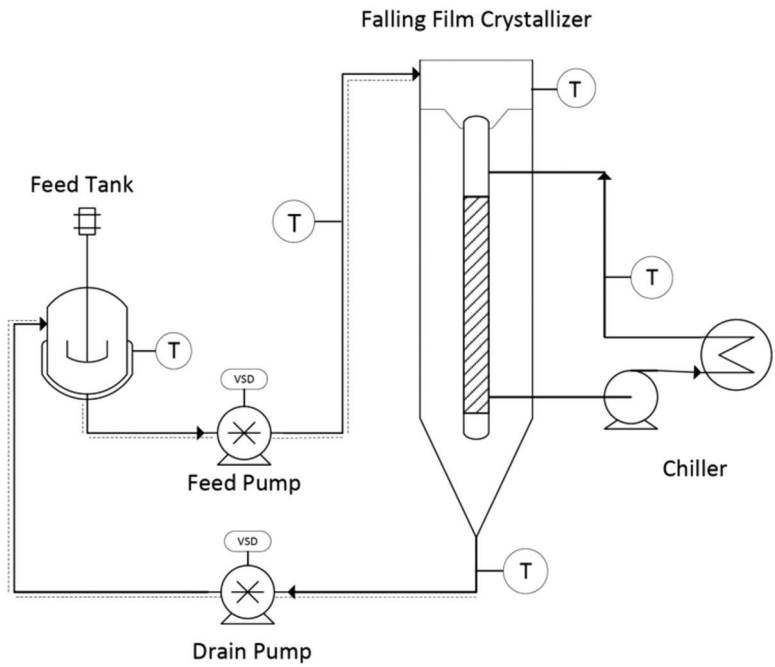

Figure 7.16 Process flow diagram of falling film layer crystallization. Reprinted with permission from ref. 264, Copyright 2016 American Chemical Society.