

Taylor Vortex Flow on Phase Transformation of Guanosine 5-Monophosphate (GMP) in Drowning-out Crystallization

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A continuous Couette-Taylor (CT) crystallizer exploiting the Taylor vortex flow is studied to promote the GMP phase transformation. In the drowning-out crystallization, GMP was initially precipitated out in a form of amorphous solids and then slowly transformed into hydrate crystalline solids via the consecutive dissolution of the amorphous GMP and growth of hydrate GMP crystals. Owing to the intensive radial mixing of the Taylor vortex flow in the crystallizer, the dissolution of the amorphous GMP and growth of the hydrate GMP crystals are significantly promoted, resulting in a complete phase transformation within a mean residence time of 7 minutes with a moderate rotating speed of 300rpm for the inner cylinder and high GMP feed concentration of 150 g/l. This was found to be at least 5 times faster than the phase transformation in a MSMR crystallizer at the same agitation speed, feed concentration, and mean residence time. The effectiveness of the Taylor vortex for the phase transformation over the turbulence eddy in the MSMR crystallizer is proven by using an empirical correlation of the mass transfers.