

Effect of Humidity on In-Process Crystallization of Lactose During Spray Drying

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Abstract : The effect of various humidities on process yields and degrees of crystallinity for spray-dried powders from spray drying of lactose with humid air in a straight-through system have been studied. It has been suggested by Williams-Landel-Ferry kinetics (WLF) that a higher particle temperature and lower glass-transition temperature would increase the crystallization rate of the particles during the spray-drying process. Freshly humidified air produced by a Buchi-B290 spray dryer as a humidifier attached to the main spray dryer decreased the particle glass-transition temperature (T_g), while allowing the particle temperature (T_p) to reach higher values by using an insulated drying chamber. Differential scanning calorimetry (DSC) and moisture sorption analysis were used to measure the degree of crystallinity for the spray-dried lactose powders. The results showed that higher T_p - T_g , as a result of applying humid air, improved the process yield from 21 ± 4 to $26 \pm 2\%$ and crystallinity of the particles by decreasing the latent heat of crystallization from 43 ± 1 to 30 ± 11 J/g and the sorption peak height from $7.3 \pm 0.7\%$ to $6 \pm 0.7\%$.

Keywords : lactose, crystallization, spray drying, humid air

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