

## 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  $21 \pm 4$  to  $26 \pm 2\%$  and crystallinity of the particles by decreasing the latent heat of crystallization from  $43 \pm 1$  to  $30 \pm 11$  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

**Conference Title :** ICCBE 2014 : International Conference on Chemical and Biochemical Engineering

**Conference Location :** Barcelona, Spain

**Conference Dates :** October 27-28, 2014