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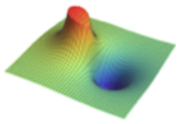

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Effects of pneumatically conveyed silica particles and one type of antistatic agent on electrostatic charging in a polyethylene gas-solid fluidized bed

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Electrostatic charging is an unavoidable and undesired phenomenon that occurs in many gas-solid processes. A commercial process adversely affected by electrostatic charging is the ethylene gas-phase polymerization in which, electrostatically charged catalyst and growing polyethylene particles adhere to the reactor wall and cause a problem known as “sheeting”. Breakage of the sheets off the reactor wall can block the reactor and in turn result in undesired production discontinuity due to reactor shutdown for clean-up. Despite an ongoing research since 1980s on the effect of electrostatic charging on polyethylene reactor sheeting, the underlying mechanisms of the catalysts as well as the antistatic agents (ASAs), which are typically pneumatically conveyed into the reactors, on the sheeting has received minimal attention [1,2]. In this work, the effects of silica catalyst support and one type of ASA on the extent of electrostatic charging and fouling of polyethylene resin were investigated. Both additives were pneumatically conveyed into an atmospheric gas-solid fluidized bed at different concentrations. The charge on the additives upon entering the fluidized bed was calculated by measuring the electric current from the conveying line. It was found that the silica particles switched the bed net charge polarity by inducing negative polarity, whereas the ASA promoted net positive polarity by inducing positive polarity. The wall fouling magnitude varied depending on the additive concentration within the bed.

References

[1] B.D. Fulks, S.P. Sawin, C.D. Aikman, J.M. Jenkins, Process for reducing sheeting during polymerization of alpha-olefins, US 4532311, 1985.

[2] D. Song, P. Mehrani, Mechanism of particle build-up on gas-solid fluidization column wall due to electrostatic charge generation, Powder Technol. 316 (2017) 166–170.