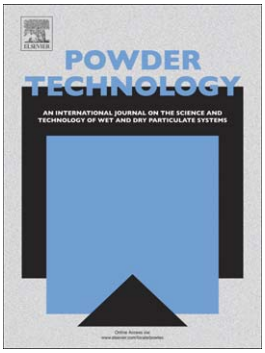

Continuous powder mixing of segregating mixtures under steady and unsteady state regimes: Homogeneity assessment by real-time on-line image analysis

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Continuous powder mixing of segregating mixtures under steady and unsteady state regimes: Homogeneity assessment by real-time on-line image analysis

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Abstract

Continuous powder processes, such as continuous powder mixing, are more than ever envisioned as a viable alternative to batch equipment, in various industries such as pharmaceuticals, specialty chemicals (zeolites, SiC), bio-renewables or food. In the present work we have implemented an on-line image analysis set-up that is able to capture all the particles at the outlet of a continuous pilot-scale mixer. This allows the determination of the homogeneity of mixtures of two different compositions, as well as the analysis of their evolution during steady-state and transitory regimes. The importance of a proper definition of the scale of scrutiny of the mixture is emphasized by providing homogeneity results obtained at four different scales. Evidence of segregation by percolation giving rise to the enrichment of the mixer's bed with fine particles is given and commented. The impact of the stirrer's rotational speed on the quality of the mixtures, as provided by the coefficient of variation CV, is reported. Up to 20 Hz, CV's are extremely high, while above 30 Hz, the influence of the impeller speed is much weaker. Finally, the influence of impeller speed's step perturbations is measured and commented. Due to the size – segregation phenomenon inside the mixer, negative steps are deeply detrimental to the mixing process. On the contrary, positive steps can be absorbed by the equipment without degradation of the quality of the mixtures.

Keywords: image analysis, powder mixing, continuous mixer, on-line analysis, mixture homogeneity