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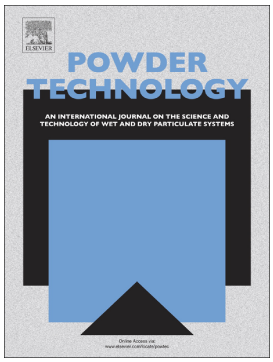

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1. Introduction

Solid-gas fluidized bed reactors have many advantages compared to other solid-gas contacting techniques: superior mixing properties and hence virtually isothermal conditions, high heat and mass transfer rates between gas and particles, high heat transfer rates between the fluidized bed and immersed objects and their suitability for large-scale applications. Due to the smooth liquidlike flow of particles, continuous automatically controlled operation can be achieved. They are employed in numerous industrial applications, such as gasification, combustion, synthesis reactions, cracking and various other chemical and metallurgical processes [1,2]. Although they are applied in many industrial operations, the flow dynamics in fluidized beds are not understood comprehensively because it is difficult or sometimes even impossible to obtain sufficient experimental data to quantify intrinsic phenomena. For design, performance optimization and scale up of fluidized bed systems, a proper understanding of the complex flow hydrodynamics is important. Especially the