

Measurement and Control of Particle Tribocharging

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Abstract— Powders and particulate solids are widely used in industry. When handled in air, their surfaces become triboelectrically charged and several other phenomena occur. For instance, in pneumatic transport lines and fluidized beds, particles become charged and adhere to the walls. If the particles are excessively charged, an electrostatic discharge will occur, which can cause fire and explosion hazards. Additionally, electrostatic forces can control the motion of charged particles; thus, many applications have been developed, e.g., electrostatic precipitation, particle separation, electrophotography, and dry powder coating [1, 2]. Moreover, the charge on particles can provide useful information regarding the state of various processes, e.g., powder flow rate, concentration, and several others [3, 4]. To analyze particle charging, the measurement of electrostatic charge and the evaluation of electrostatic characteristics are important; to improve existing processes and to develop new applications, it is necessary to obtain an in-depth understanding of these qualities based on theoretical analyses.

In this review, the basic concepts and theories of charge transfer between solid surfaces are summarized and a model of particle charging caused by repeated impacts on a wall is formulated [1–8]. On the basis of these concepts and the results of the formulation, novel methods for the control of particle tribocharging are presented [9–11]. In particular, a method using an applied electric field is expected to be applicable in industrial fields.

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