

Electrostatic Charging and its Impact on Powder Flowability

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ABSTRACT

It is recognized that the electrostatic charging can affect the flowability of powders. Tribocharging is generally associated with the exchange of electrons during the friction of dissimilar materials. While charging is usually more important for nonconductive materials, it has been observed that electrostatic (i.e. coulombic) forces can also affect the flow of metallic powders. Tribocharging may be associated with powder handling but may also arise during the characterisation and processing of the powders. Interparticle interactions are affected by charge distribution (i.e. the attraction coming from particles having different polarities) which are difficult to measure experimentally. Powder flowability and rheology have recently been used to demonstrate the effect of coulombic forces on particle interaction and flowability. This paper presents an evaluation of the effect of tribocharging on the rheology of different metallic powders (IN718, Al-Mg, Ti6Al4V, SS 316L and glass). Results show that charging is dependant of the nature of the materials in contact. In some cases, the effect of charging can be significant and affects the rheology of the powders.

INTRODUCTION

Flowability is a property that defines the ability of a powder to flow in a desired manner within a specific piece of equipment. This property is not an inherent material property and is affected by many factors such as powder characteristics (e.g. particle morphology, size distribution, presence of satellites, density, surface texture and composition, adsorbed species), testing conditions (type of flow, testing equipment, measurement conditions ...) as well as environmental and handling conditions (e.g., humidity, temperature, atmosphere...).