

Oblique Single-particle Impact Charging – The Effect of Normal and Tangential Forces

Peter M. Ireland

Centre for Advanced Particle Processing, Discipline of Chemical Engineering

University of Newcastle, Australia

e-mail: Peter.Ireland@newcastle.edu.au

Abstract— Triboelectric charging of particles is an important component of a variety of industrial processes, e.g. triboelectric separation and electrophotographic toner charging. Many charging methods rely on dynamic contact between the particles and a charging surface (such as an earthed metal plate), and a number of studies have therefore been conducted into this type of contact, including at least one* on oblique impingement of a particle flow with inclined and rotating targets. Here, we discuss our work on oblique impact charging. The aim has been to obtain far more detail than has hitherto been available by measuring the normal and tangential forces during individual single impacts using fast load cells, and observing the process with a high-speed camera. In other words, we have aimed to find out as much as possible about the dynamic conditions during each individual collision that lead to the particular exchange of charge. This includes the magnitude of the force and duration of the interaction, the number of sub-impacts, and the contact mode (rolling or sliding). To complement this, slower rolling and sliding interactions between the same particles and target have been performed using a new apparatus that actuates the normal and horizontal forces in a controlled way.