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Investigations on the correlations of fragmentation, penetration and charge transfer of Pt and SiO₂ particles due to inertial impaction on TEM grids, Cu and Si wafer targets

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Abstract

A simple method to reveal and study de-agglomeration and bouncing processes is the inertial impaction in a single-stage low pressure impactor (SS-LPI) with a downstream electrometer that monitors the penetration. In this study such a set-up was employed to sample deposited Pt and SiO₂ agglomerates on TEM grids while bouncing fragments were detected simultaneously by the downstream electrometer. In this way light is shed on the correlation of deposition and de-agglomeration of agglomerates. In the case of bouncing, charge transfer can be observed as well. In order to investigate the effect of the target material on impact charging, SiO₂ agglomerates and spheres have been impacted on conductive Cu and semi-conductive Si wafer targets.

Keywords: low pressure impactor; inertial impaction; nano-agglomerates; fragmentation; bouncing; charge transfer

1 Introduction

Low pressure impactors are widely used for the characterization of the aerodynamic properties of aerosols but also for the determination of agglomerate strength by impact fragmentation (Fernandez de la Mora et al., 1990; Keskinen et al., 1992; Seipenbusch et al., 2002). Upon inertial impaction of particles at high velocities however, insufficient absorption of the kinetic energy by the particle or the impaction target may lead to rebound and therefore re-aerosolization (Dahneke, 1972). This “bouncing” phenomenon is a major issue in the use of the aerosol impactor technology and may falsify the experimental data obtained with it. In multistage impactors this phenomenon leads to the deposition of particles in lower stages and

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