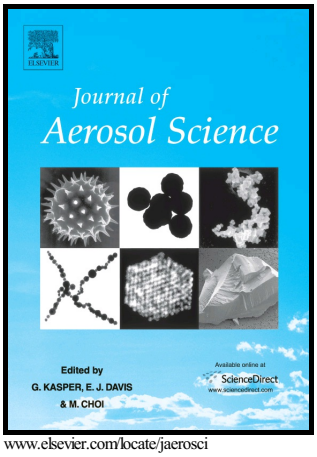
Author's Accepted Manuscript



www.elsevier.com/locate/jaerosci

A numerical study of electric force effects on detachment and deposition of particles due to a falling disk

D. Malekian, B. Sajadi, G. Ahmadi, M. Pirhadi

PII: S0021-8502(18)30116-2
DOI: https://doi.org/10.1016/j.jaerosci.2018.08.001
Reference: AS5321

To appear in: *Journal of Aerosol Science*

Received date: 28 March 2018
Revised date: 2 August 2018
Accepted date: 6 August 2018

Cite this article as: D. Malekian, B. Sajadi, G. Ahmadi and M. Pirhadi, A numerical study of electric force effects on detachment and deposition of particles due to a falling disk, *Journal of Aerosol Science,* https://doi.org/10.1016/j.jaerosci.2018.08.001

A numerical study of electric force effects on detachment and deposition of particles due to a falling disk

D. Malekian[1], B. Sajadi[1], G. Ahmadi[2], M. Pirhadi[1]

[1]School of Mechanical Engineering, College of Engineering, University of Tehran, Tehran, Iran

[2]Department of Mechanical & Aeronautical Engineering, Clarkson University, Potsdam, NY, USA

Abstract

One of the main sources of particulate matter (PM) in indoor environments is particle resuspension due to human activities such as walking. In many situations, surfaces are charged, and electric forces become important. As the human gait cycle induced airflow and electric fields and their interaction with particle resuspension, dispersion and deposition are rather complicated, using a simplified model can help to gain a better understanding of process. In this study, the effect of presence of electric field on particle detachment and deposition due to a falling disk was investigated using a computational modeling approach. For this purpose, a charged disk was considered to be falling freely on a rough surface from a specific height. The disk electric potential developed an electric field throughout the domain that intensified as the disk gets closer to the floor. The electric field charged the particles that were resting on the floor by the field charging mechanism. It was found that the presence of electric force decreased the critical shear velocity needed to detach the particles; however, the reduction was negligible for particles smaller than 5 μm. In addition, the simulation results showed that the number of particles deposited on the disk increased with the size of particles in the presence of electric field. The results of this study provide a better understanding of the