

Study of Particle Collection Using Magnets

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Abstract

Airborne particles or aerosols are an unstable system with distributed properties among its individual particulate members. Its fundamental property such as particle size, composition, electrical conductivity, magnetic susceptibility, and morphology could change in response to environmental conditions and could be exploited for collection and other applications. Detection and collection of aerosol particles may involve particle flow through an instrument that operated. During transport through the instrument, the particles would experience several forces, simultaneously. These forces are for example aerodynamic (impaction, interception, and diffusion), electrical (if electrical field is present), thermophoretic (by temperature difference), and magnetic (under magnetic field). The effect of magnetic force on the collection of ultrafine particles is the focus to our presentation. We used the COMSOL Multiphysics® software to investigate the effect of magnetic force on particle collection and validate the model prediction by experimental data. Particles of different magnetic susceptibility were generated for experiments. The simulated magnetic field strength was close to the measurements within the experimental uncertainty.

Reference

1. Cheng, M.-D., S.L. Allman, G.M. Ludtka, and L.R. Avens (2014) *J Aerosol Sci.*, 77: 1-9.
2. Cheng, M.-D., G.M. Ludtka, and L.R. Avens (2016) US Patent # 9,387,486, July 12.

Figures used in the abstract

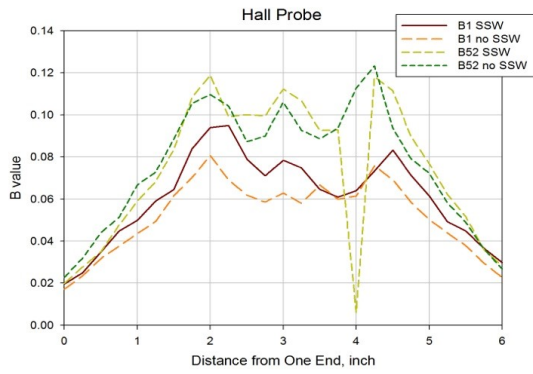


Figure 1: Measured Magnetic Field Strength

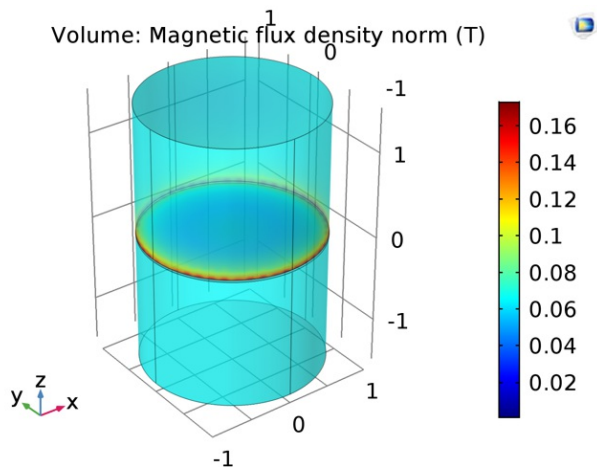


Figure 2: Simulated Magnetic Field Strength