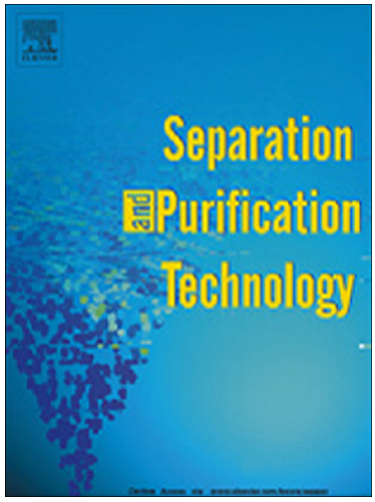


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# Study on subway particle capture by ferromagnetic mesh filter in nonuniform magnetic field

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**Abstract**:

A two-step method to understand the dust particle capture process in a magnetic field gradient was presented. Dust capture depended strongly on the magnetic force exerting on the particle which implies large particle size, slow flow velocity and large magnetic field gradients would increase the deposition. Aggregates of nano-sized particles observed in the captured dust sample were composed mainly of iron compounds. Low velocity was beneficial for capture of 1 μm particles, while high velocity facilitated the capture of larger particles (≥ 2.5 μm). Complex weaving aided the particle collection in a relatively low flow field while simple weaving was more favorable at higher flows. Predictions of the magnetic capture efficiency of the entire filter were established qualitatively and quantitatively based on a subdomain simulation employing a cubic structure. Wire magnetization is useful for small particles with a fine filter, while relatively large particles such as 10 μm and 2.5 μm were good for medium and coarse mesh filters. Investigation of screen mesh weaving and the distance between magnets provided an optimum filter screen configuration and optimum operating parameters. The experimental results agreed quite well with the simulation work.

**Keywords:** iron dust; magnetic filtration; magnetic field gradient, woven mesh,

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