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**Models of particle capture in high gradient magnetic separation** ALMUT EISENTRAEGER, IAN GRIFFITHS, DOMINIC VELLA, University of Oxford — High gradient magnetic separation is an efficient way to remove magnetic and paramagnetic particles, such as heavy metals, from waste water. As the water flows through a mesh of magnetized steel wool, high magnetic gradients around the wires attract and capture the particles. We model such a system by considering a single point dipole travelling through a periodic array of magnetized cylinders. We show that there is a critical Mason number (dimensionless flow velocity) below which the particle is captured independent of its initial position. Above this threshold, particle capture is only partially successful and depends on the particle's initial position. We determine the relationship between the critical Mason number and geometry using numerical and asymptotical calculations. To develop these ideas further, we also discuss briefly the aggregation of particles into chains.

Almut Eisentraeger
University of Oxford

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