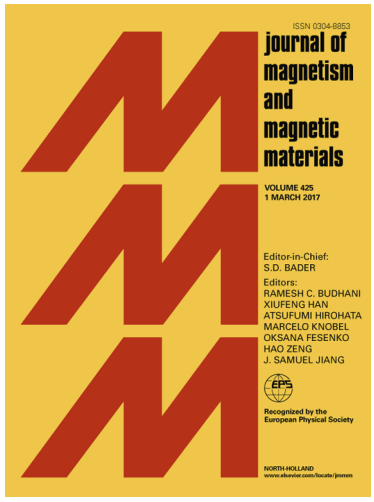

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Retention of ferrofluid aggregate at the target site during Magnetic Drug Targeting

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Abstract

The present study reports the retention dynamics of a ferrofluid aggregate localized at the target site inside a glass capillary ($500 \times 500\ \mu m^2$ square cross section) against a bulk flow of DI water ($Re = 0.16$ and 0.016) during the process of magnetic drug targeting (MDT). The dispersion dynamics of iron oxide nanoparticles (IONPs) into bulk flow for different initial size of aggregate at the target site is reported using the brightfield visualization technique. The flow field around the aggregate during the retention is evaluated using the μPIV technique. IONPs at the outer boundary experience a higher shear force as compared to the magnetic force, resulting in dispersion of IONPs into the bulk flow downstream to the aggregate. The blockage effect and the roughness of the outer boundary of the aggregate resulting from chain like clustering of IONPs contribute to the flow recirculation at the downstream region of the aggregate. The entrapment of seeding particles inside the chain like clusters of IONPs at the outer boundary of the aggregate reduces the degree of roughness resulting in a streamlined aggregate at the target site at later time. The effect of blockage, structure of the aggregate, and disturbed flow such as recirculation around the aggregate are the primary factors, which must be investigated for the effectiveness of the MDT process for *in vivo* applications.

Keywords: Magnetic drug targeting, Ferrofluid, Brightfield visualization, μPIV