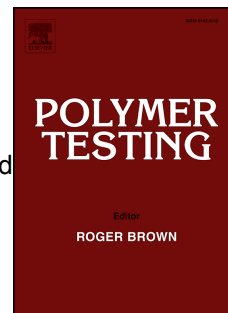


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Test Method

## Density measurement for polymers by magneto-Archimedes levitation: simulation and experiments<sup>1</sup>

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**Abstract:** In a magneto-Archimedes levitation device, a polymer can be levitated in a paramagnetic medium, and its equilibrium levitated height is mainly related to its density. Here, a novel density measurement method for polymers via magneto-Archimedes levitation is proposed, in which the relationship between the density and the levitated height is determined through numerical simulation. COMSOL software is employed to simulate the distribution of magnetic field in the device, and FLUENT-EDEM multiphase software is adopted to predict the polymer's levitated height. A 3rd-order polynomial equation is fitted by simulation results for density calculation. Several experiments with different devices, different magnets, different mediums, and various polymers were carried out to verify the proposed method. Experimental results showed that the proposed method has high accuracy (0.0060 - 0.0130 g/cm<sup>3</sup>) in density measurements for small polymer samples (~ 25 mm<sup>3</sup>). In general, the proposed method has prospects of broad application in polymer density-based testing.

**Keywords:** Density measurement; Magneto-Archimedes levitation; Numerical simulation; Polymer testing

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