Dynamic parameters of superparamagnetic carriersonnano-bio-interfaces

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Dynamic parameters of superparamagnetic carrierson the substrate coated by DNA are studied with anjoint experimental/numerical approach. The acting magnetic forces on the superparamagnetic carriers are provided by micro-magnets under an applied in-plane rotating magntic field, and obtained numericallyusing the finite element method(FEM) simulation depending on the measured magnetic performances of the superparamagnetic carriers and the micro-magnets. In order to acquire a maximum control ability on the carriers, the optimized scale ratio between the carrier size and the diameter of micro-magnets is demonstrated by the experiments and simulations. Moreover, the maximumrotational force on the carriers is given at the phase angle of $\pi/4$ based on the direction of the applied field, and at the optimum ratio of that the radius of micro-magnets is around 2 times of the carrier diameter, depending on the magnetization of the mcro-magnets under an applied field. Additionally, the retarding forces of the carriers on the DNA substrate are estimated numerically, sticking force, viscous force and friction force.