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Manipulation of red blood cells with electric field[1] HOSSAIN SABOONCHI, ASGHAR ESMAEELI, Southern Illinois University at Carbondale — Manipulation of bioparticles and macromolecules is the central task in many biological and biotechnological processes. The current methods for physical manipulation takes advantage of different forces such as acoustic, centrifugal, magnetic, electromagnetic, and electric forces, as well as using optical tweezers or filtration. Among all these methods, however, the electrical forces are particularly attractive because of their favorable scale up with the system size which makes them well-suited for miniaturization. Currently the electric field is used for transportation, poration, fusion, rotation, and separation of biological cells. The aim of the current research is to gain fundamental understanding of the effect of electric field on the human red blood cells (RBCs) using direct numerical simulation. A front tracking/finite difference technique is used to solve the fluid flow and electric field equations, where the fluid in the cell and the blood (plasma) is modeled as Newtonian and incompressible, and the interface separating the two is treated as an elastic membrane. The behavior of RBCs is investigated as a function of the controlling parameters of the problem such as the strength of the electric field.

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