Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Dynamic Simulation of Trapping and Controlled Rotation of a Microscale Rod Driven by Line Optical Tweezers[1] MAHDI HAGHSHENAS-JARYANI, ALAN BOWLING, University of Texas at Arlington, Department of Mechanical and Aerospace Engineering, SAMARENDRA MOHANTY, University of Texas at Arlington, Department of Physics — Since the invention of optical tweezers, several biological and engineering applications, especially in micro-nanofluid, have been developed. For example, development of optically driven micromotors, which has an important role in microfluidic applications, has vastly been considered. Despite extensive experimental studies in this field, there is a lack of theoretical work that can verify and analyze these observations. This work develops a dynamic model to simulate trapping and controlled rotation of a microscale rod under influence of the optical trapping forces. The laser beam, used in line optical tweezers with a varying trap's length, was modeled based on a ray-optics approach. Herein, the effects of viscosity of the surrounding fluid (water), gravity, and buoyancy were included in the proposed model. The predicted results are in overall agreement with the experimental observation, which make the theoretical model be a viable tool for investigating the dynamic behavior of small size objects manipulated by optical tweezers in fluid environments.

[1]This material is based upon work supported by the National Science Foundation under Grant No. MCB-1148541.

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Date submitted: 28 Nov 2012 Electronic form version 1.4