Simulations of Nanoparticle Distributions under Magnetic Forces for Targeting and Probing the Microenvironment of Cancerous Cells

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Objective

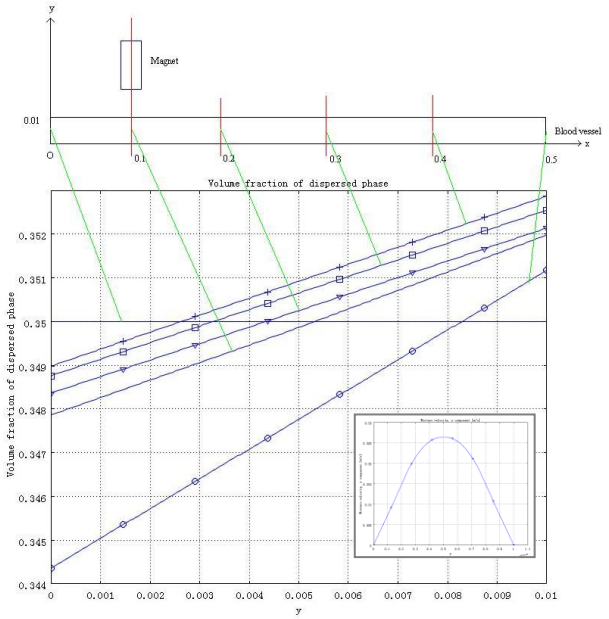
Magnetic nanoparticles can be perturbed by an external magnetic field and the resultant displacements can be optically measured with nano-scale accuracy. The objective of this project is to use this technique to target cancerous cells and tissues under different flow conditions and magnetic field modulations.

Research Highlights

- Finite element simulations have been conducted to understand the dynamical responses of the nanoparticles within capillary tubes filled with a viscous fluid.
- The nanoparticle concentration distributions at various locations along the tube under external magnetic field are obtained.

Future Research

- Consider the effects of nanoparticle size on their dynamical responses to external magnetic field.
- Compare the simulation results with experimental observations to understand the mechanisms of nanoparticle delivery in presence of cancer cells.



Numerical simulations of nanoparticle concentration distribution in a capillary tube filled with viscous fluid under the influence of external magnetic field. Inset shows the fluid velocity profile.