Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Improved Fibrinolysis Using Magnetically Driven Colloidal Microwheels DANTE DISHAROON, ONUR TASCI, ROGIER SCHOEMAN, KULDEEPSINH RANA, Colorado Sch of Mines, PACO HERSON, UC Denver, DAVID MARR, KEITH NEEVES, Colorado Sch of Mines — At the microscale, fluid dynamics are unique because viscous forces dominate over inertial forces, with Reynolds numbers typically less than unity. To move through microscale channels (order 100 μ m) over macroscale distances (>1 cm) devices based on cellular machinery have been developed, but they are slow and difficult to implement within in vivo environments. To address these issues, we report the assembly and translation of magnetically-powered colloidal microwheels (μ wheels) capable of translation at speeds of over 100 μ m/s. In this, superparamagnetic microparticles cluster into wheel-like shapes that spin when subject to an order milliTesla planar rotating magnetic field. By exploiting wet friction between μ wheels and adjacent surfaces, not only can significant μ wheel translation speeds be achieved but also travel direction can be precisely and rapidly controlled. With both assembly and translation manipulated via non-gradient external magnetic fields that do not attenuate in tissue, this method is well-suited for drug delivery. We demonstrate this by showing that μ wheels functionalized with fibrinolytics can dissolve blood clots five-fold faster than soluble fibrinolytics at therapeutic concentrations.

Dante Disharoon
Colorado Sch of Mines

Date submitted: 05 Sep 2017 Electronic form version 1.4