Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Numerical and experimental study of Newtonian and non-Newtonian flow in a spiral viscous pump ANDREAS GUSTAFSSON, Kungliga Tekniska Högskolan, Stockholm, Sweden, GUSTAF MÅRTENSSON, MYDATA automation AB, Bromma, Sweden — The need to transport small volumes of viscous media is a vital part of microfluidic applications in biotechnology, chemistry and electronics. A novel Archimedean viscous micro-pump was developed in an attempt to achieve the precise and accurate delivery of fluid in a robust and industrially viable package. The pump consists of a two-disc system, where one is patterned with a spiral rectangular channel and the other is smooth and has a rate of rotation Ω in order to pump the fluid. The width of the channel is variable along its length in order to achieve a constant local Reynolds number and avoid recirculation zones along the spiral, which is described $r = a + b\theta^c$, where r is the radius at the spiral centerline and θ is the azimuthal angle. Numerical and analytical studies of the proposed model exhibiting a linear relationship between the flow Q and Ω will be presented, as well as results from experiments with a simplified prototype supporting the analytical and numerical studies.

Gustaf Mårtensson
MYDATA automation AB, Bromma, Sweden

Date submitted: 12 Aug 2008 Electronic form version 1.4