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Numerical and experimental study of Newtonian and non-
Newtonian flow in a spiral viscous pump ANDREAS GUSTAFSSON, Kungliga
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tomation 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 \( \theta \) is the azimuthal angle. Numerical and analytical studies of the
proposed model exhibiting a linear relationship between the flow \( Q \) and \( \Omega \) will be
presented, as well as results from experiments with a simplified prototype supporting
the analytical and numerical studies.

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