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Stokesian locomotion in elastic fluids: Experiments ROBERTO ZENIT, Universidad Nacional Autonoma de Mexico, ERIC LAUGA, University of California at San Diego — In many instances of biological relevance, self-propelled cells have to swim through non-Newtonian fluids. In order to provide fundamental understanding on the effect of such non-Newtonian stresses on locomotion, we have studied the motion an oscillating magnetic swimmer immersed in both Newtonian and non-Newtonian liquids at small Reynolds numbers. The swimmer is made with a small rare earth (Neodymium-Iron-Boron) magnetic rod (3 mm) to which a flexible tail was glued. This array was immersed in cylindrical container (50 mm diameter) in which the test fluid was contained. A nearly uniform oscillating magnetic field was created with a Helmholtz coil (R=200mm) and a AC power supply. For the Newtonian case, a 30,000 cSt silicon oil was used. In the non-Newtonian case, a fluid with nearly constant viscosity and large first normal stress difference (highly elastic) was used; this fluid was made with Corn syrup with a small amount of polyacrylamide. The swimming speed was measured, for different amplitudes and frequencies, using a digital image analysis. The objective of the present investigation is to determine whether the elastic effects of the fluid improve or not the swimming performance. Some preliminary results will be presented and discussed.

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