Measurement of shear flow induced forces on helical screws

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Abstract

We have measured the forces in the vorticity direction experienced by chiral screws in shear flows, with the Reynolds number at the order of 10^3. The measured force directions depend on the screw handness, being in the positive vorticity direction for left-handed screws and opposite for right-handed ones. These directions are the reverse of those predicted in the low Reynolds number (Stokes flow) calculations [Phys. Fluids **17**, 10365 (2005)]. The force magnitude scales with the cube of the shear rate and is about 100 dynes (on the order of 10% of the drag force) when the shear rate ~ 10 sec^{-1}.

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