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Probing Viscoelasticity of Cholesteric Liquid Crystals in a Twisting Cell[1] JOSEPH ANGELO, ALIREZA MOHEGHI, NICK DIORIO, ANTAL JAKLI, Liquid Crystal Institute — Viscoelastic properties of liquid crystals are typically studied either using Poiseuille flow, which can be produced by a pressure gradient in a capillary tube,[2] or Couette flow, which can be generated by a shear between concentric cylinders.[3] We use a different method in which we twist the liquid crystal sandwiched between two cylindrical glass plates, one of which can rotate about its center, the other of which is fixed. When the cell is twisted, there is a force proportional to the twist angle and the twist elastic constant, and inversely proportional to the pitch and sample thickness, normal to the substrates due to the change in pitch in the cholesteric liquid crystal (CLC). Measuring this force on various CLCs with known pitch we could obtain the twist elastic constants. In addition to the equilibrium force, we observed a transient force during the rotation, which is related to the flow of the material, thus allowing us to determine the Leslie viscosity component α_1, which typically cannot be assessed by other methods. We expect this apparatus to be a useful tool to study the visco-elastic properties of liquid crystals.

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[2]R. J. Atkin, "Poiseuille Flow of Liquid Crystals of the Nematic Type, ARCHIVE FOR RATIONAL MECHANICS AND ANALYSIS, **38**, 224-240 (1970)
[3]CLADIS, P. E., & S. TORZA, "Stability of nematic liquid crystals in Couette flow". *Phys. Rev. Lett.* **35**, 1283-1286 (1975).

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