

## Documents

Kristiawan, M., Hassan, M.E., Faye, A.E., Sobolík, V.

### **Experimental investigation of Taylor-Couette-Poiseuille flow at low Taylor and Reynolds numbers**

(2019) *PLoS ONE*, 14 (4), art. no. e0212728, .

#### **Abstract**

Flow patterns of a Taylor-Couette-Poiseuille flow were studied at low axial Reynolds and rotational Taylor numbers ( $Re$  10.5,  $Ta$  319). The radius ratio of the inner and outer cylinders was 0.804 and the ratio of the length of the annulus to the gap width was 44.5. Complete map of the studied flow regimes was elaborated. The axial and azimuthal components of the wall shear rate  $\dot{\gamma}$  were measured at the outer fixed cylinder using a three-segment electrodiffusion probe. The components of the wall shear rate of helices have never been measured in previous investigations. Spatio-temporal description of multiple flow patterns was obtained using flow visualizations and simultaneous measurements of wall shear rate components. The flow structures include Taylor vortices, helices winding in the same direction as the base flow or in the opposite direction, helices that were stagnant or moving in the axial direction, smooth or with superposed azimuthal waves, among others. The influence of different flow structures on the wall shear stress components is discussed with and without axial base flow. It was found that the wall shear stress is a function of  $Ta$  but no significant dependence on  $Re$  was observed for the studied flow regimes and that the mean wall shear stress increases with the number of azimuthal waves. It was also noted that the ED probes provide a more detailed information about flow patterns than torque measurements and visualizations described in the literature. © 2019 Kristiawan et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

2-s2.0-85063814129

**Document Type:** Article

**Publication Stage:** Final

**Source:** Scopus

**Access Type:** Open Access