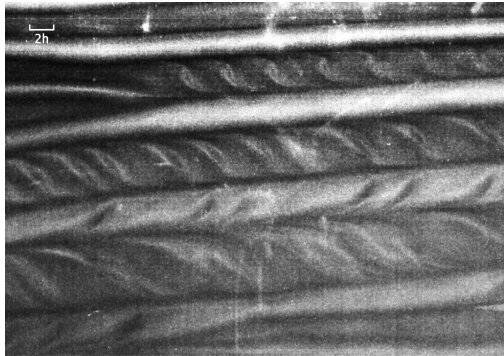


Stability Effect of Fibrils Cellulose on the Couette Flow with System Rotation

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Solution of water with nano-fibrillated cellulose (NFC) is used in the industry for paper making process. In order to improve and have a better control of this process it is important to know the effect on the flow of these NFC. In this perspective this study will focus on the effect of the NFC concentration on the stability of a classical flow. We use a rotating Couette flow experiment (described in



Tsukahara, et al. JFM, 2010), this flow is characterized by two dimensionless parameters for the water case : the Reynolds number Re and the rotation number Ω . Depending on these two parameters the flow can be a Couette flow, a roll cells flow (see figure) or a turbulent flow. Previous studies have shown that for water the Coriolis force - due to the system rotation - can, depending on the rotational direction, either stabilize (cyclonic rotation) or destabilize (anticyclonic rotation) the flow.

In this study we will first focus on the effect of the NFC concentration on the stability of the flow; i.e. on the transition from Couette flow to roll cells and then to turbulent regimes. We will compare these transitions with previous studies that has been done for water. In fact it has been shown that adding NFC to water can have a stabilizing effect and can delay the transition from laminar to turbulent regimes. The different types of flow - i.e. different roll cells and turbulent regimes - will also be studied and characterized.

A. Suryadi, N. Tillmark & P.H. Alfredsson. Velocity measurements of streamwise roll cells in rotating plane Couette flow, J. Experiments in Fluids, 2013