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Self-organization of fibers in a flow between two counter-rotating discs CHARLOTTE AHLBERG, FREDRIK LUNDELL, DANIEL SÖDERBERG, KTH Mechanics — The behavior of fibers suspended in a flow between two flat counter-rotating discs has been studied experimentally. A CCD-camera was used to capture images of the fibers in the flow. Image analysis based on the concept of steerable filters extracted the position and orientation of the fibers in the plane of the discs. Experiments were performed for gaps between the discs of 0.2 to 0.9 fiber lengths, and for equal absolute values of the velocities for the upper and lower disc. The length-to-diameter ratio of the fibers was 23. Depending on the angular velocities of the discs and the gap between them, the fibers were found to organize themselves in fiber trains. A fiber train is a set of fibers positioned one after another in the tangential direction with a close to constant fiber-to-fiber distance. Each individual fiber is aligned in the radial direction (i.e. normal to the main direction of the train). The experiments show that the number of fibers in a train increases when the gap between the discs decreases. Furthermore, the number of fibers in a train decreases at both high and low angular velocities with an optimum in between.

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