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Investigation of banding pattern of non-colloidal monodisperse suspension in a partially filled coquette flow

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Monodisperse suspension flow forms an extensive section of natural and technological flows. Biological systems, food processing, ceramic injection, and dynamic filtration are examples of areas that such flows arise. Various complicated particle interactions and their inevitable influence on and from the continuous phase result in some interesting phenomena, which sometimes are challenging to justify. This research studies one of those challenges, known as banding pattern of suspension in a partially filled Couette flow. Previous studies show that when a mono disperse suspension undergoes a rotational sheared motion in a partially filled horizontal Couette cell, particles leave their initial uniformly distribution and migrate to concentrated regions. Formation of such dense regions results in concentrated ring shape regions perpendicular to axis of rotation adjacent to comparatively dilute rings. In this research, we study the parameters that are crucial in formation of bands. Results are reported using experimental investigation of banding formation at small Reynolds number. The results show strong dependence of band number and profile on suspension concentration, filling fraction, capillary and stokes number, as well as the rotation of the inner cylinder. Moreover, the experimental results confirm the dynamics of Taylor vortices and an additional cell in the longitudinal axis, which may responsible to the motion of the particles and creation of bands.

Biography

Parisa Mirbod is an Assistant Professor of Mechanical and Aeronautical Engineering at Clarkson University from July 2012. She holds an Engineering Diploma in Mechanical Engineering from Isfahan University of Technology in Isfahan, Iran, an MSc of Mechanical Engineering in the field of energy conversion from University of Sistan and Baluchestan in Iran, and a PhD in Mechanical Engineering from The City University of New York-Graduate Center. Her dissertation was focused on “The lift generation in soft porous media: From red cells to skiing to a new concept for train track”. She extended a new theoretical model for the generation of lift forces in highly compressible, soft porous media and proposed a novel concept to design an airborne jet train that flies a few centimeters above the earth’s surface on a soft porous track that would allow for huge fuel savings and greatly reduced greenhouse emissions. She authored technical research proposals awarded the Student Research Grant by Graduate Center, CUNY, in two consecutive, 2007-2009. She was honored the NASA Glenn Faculty fellowship in 2014, Merit-based Prestigious’ Outstanding Student Fellowship in Fall 2009’, and was a recipient of NSF Scholar, NSFGrant # 0432229 from the City College of New York, Fall 2006-2009.

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