ΣΕΜΙΝΑΡΙΟ ΚΕΝΤΡΟΥ ΚΒΑΝΤΙΚΗΣ ΠΟΛΥΠΛΟΚΟΤΗΤΑΣ & ΝΑΝΟΤΕΧΝΟΛΟΓΙΑΣ/ CCQCN SEMINAR

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11:00-12:00

3rd Floor Seminar Room

An Overview of Newtonian and Non-Newtonian Viscoplastic flows

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Abstract

In this talk we give an overview of different types of viscous fluid flows. In order to do this, we solve numerically the axisymmetric extrudate-swell flow of a compressible Newtonian and Herschel- Bulkley fluids that slips along the wall. In particular, we study the combined effects of compressibility, slip and inertia on the shape of the extrudate. Initially the fluid is taken as Newtonian obeying a linear equation of state. Then the axisymmetric extrudate swell flow of a compressible Herschel–Bulkley fluid with wall slip is solved numerically. The Papanastasiou-regularized version of the constitutive equation is employed, together with a linear equation of state relating the density of the fluid to the pressure. The combined effects of yield stress, inertia, slip, and compressibility on the extrudate shape and the extrudate swell ratio are analyzed for representative values of the power-law exponent.
In the second part of this talk, the effect of slip on the development of planar and axisymmetric Newtonian Poiseuille flows is studied. The objective of this work is to investigate the effect of wall slip in the case of a round tube which is more important in applications. Since the velocity at the wall is not zero, it is also interesting to check if there are cases where the flow at the wall develops more slowly than at the symmetry axis. In such a case, the use of an alternative definition of the development length is obviously more appropriate. Hence, we define the dimensionless wall development length, , as the length required for the slip velocity to decrease down to 1.01% of its fully developed value, and make comparisons between *L* (the length required for the maximum velocity to attain 99% of its fully-developed value) and *L*w for both the axisymmetric and planar configurations.