Asymptotic analysis of micropolar fluid flow in a curved pipe

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Abstract

The micropolar fluid model is an essential generalization of the classical Navier-Stokes model in the sense that it takes into account the microstructure of the fluid. It describes the behavior of numerous real fluids better than the classical model. The aim of this poster is to present recent result about the asymptotic approximation of the micropolar fluid flow in a thin (or long) curved pipe with an arbitrary central curve and circular cross-section. After writing the governing equations in curvilinear coordinates, the effective behavior of the flow is found via rigorous asymptotic analysis with respect to the small parameter, being the ratio between pipe's thickness and its length. We obtain the explicit formulae for the approximation showing the effects of pipe's distortion and fluid microstructure on the flow. We rigorously justify formally derived asymptotic model by proving the corresponding error estimates.

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