Isogeometric analysis of drop deformation in isoviscous shear flow

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ABSTRACT

Droplet deformation has recently become highly attractive subject due to its industrial applications. We use Boundary Integral Method (BIM) to visualize how the drop behaves in shear imposed flow while it has the same viscosity as the matrix fluid. In the usual way, the drop surface is supposed to be presented by linear triangular mesh. The novelty of this work compare to the prior studies is applying the Isogeometric Analysis (IGA) to define the drop interface. This method gives the ability to define the real smooth shape functions to create the surface instead of traditional non-smooth triangular surface. This facility is highly applicable in case a red blood cell or a vesicle deformation is investigating due to the existence of higher order terms of curvature gradient in the force jump across the interface. It is observed that the drop deforms and deviates from the initial spherical shape and orients itself in the fixed direction. The center of the spherical droplet is located initially in the center of the geometry and approximately remains in the same position during the whole simulation. Different values of capillary number which is the measure of the ratio between viscous and surface tension forces has been examined in current research.