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Dynamics of a Janus droplet in a linear shear flow MISAEL DÍAZ-MALDONADO, Department of Chemical Engineering, University of Puerto Rico Mayagüez Campus, ANDREY IVANTSOV, SERGEY SHKLYAEV, Institute of Continuous Media Mechanics, Ural Branch of the Russian Academy of Sciences, UBALDO M. CÓRDOVA-FIGUEROA, Department of Chemical Engineering, University of Puerto Rico Mayagüez Campus — Janus droplet (JD) is an object with promising applications in the design of smart materials, microfluidics, drug delivery, etc. Despite numerous experimental works, theoretical aspects of JD dynamics remain almost unstudied. Our recent paper [Phys. Fluids, 2013 (accept. for publ.)] was devoted to the generalization of the classic Hadamard–Rybczynski problem, a flow past a droplet in a constant flow. However, in most applications, a JD is subject to a nonuniform flow; the simplest case of such a flow is linear. A perfect JD – a combination of two hemispherical domains – is considered; the interfaces are assumed nondeformable. In this case semianalytical solution is valid in terms of series with respect to Lamb's functions. First, we study the rotation of JD around the axis belonging to the internal interface and couple the angular velocity of the internal interface with the viscous torque imposed on JD. This problem, in particular, allows calculating a characteristic time of JD turn under an external torque. Then, the dynamics of JD in a 1D shear flow is analyzed. For arbitrary orientation of JD with respect to the external velocity field and its gradient, the problem is decomposed into five primitive problems. The force and torque for each of these cases are found.

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