Dynamics of a non spherical microcapsule in shear flow

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As a model of red blood cell, we study equations describing the motion and deformation of a non-spherical microcapsule with incompressible interface in steady shear flow. The unstressed shape is assumed to coincide with a slightly ellipsoidal shape for which the revolution axis is parallel to the flow vorticity. Firstly, we find that the equations can be mapped onto those describing the time evolution of the vector orientation of a (rigid) spherical microswimmer in fictitious external and shear fields, for which the fluid vorticity direction and the external field, which varies with time, are secant. An exact analytical solution is found showing, as it is well known, that the microcapsule never tumbles and always attains a stationary tank-treading shape in off shear plane for which an exact analytical expression is derived.

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