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Dynamics of compound particles in a quadratic flow PAVAN KUMAR SINGEETHAM, CHAITHANYA K. V. S., SUMESH P. THAMPI, Department of Chemical Engineering, Indian Institute of Technology Madras, Chennai 600036, India — Droplets with encapsulated particles suspended in a secondary fluid are often encountered in various scenarios like nucleated cells, hydrogels, microcapsules, etc. Such ternary structures are called compound particles, and they are typically generated in microfluidic platforms, where they are exposed to a background flow. It is known that the structural stability of these structures is sensitive to the type, and strength of the background flow. In this work, we theoretically investigate the translational, and deformation dynamics of a concentric compound particle in an imposed quadratic flow in the absence of inertia (Reynolds number = 0), and assuming that the confining drop is nearly spherical (low capillary number, $Ca << 1$). Increase in the size of the particle, or the viscosity of the droplet fluid enhances the deformation of the confining interface, thus reducing the stability of a compound particle. Deformation of the confining interface is lesser in quadratic flow compared to a linear flow, indicating weaker hydrodynamic interactions in the quadratic flow. Besides, we analyze the dynamics of a compound particle in a pulsatile quadratic flow, which can be used to transport them in microfluidics without breaking up the confining interface.

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