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Dynamics of a compound vesicle in shear flow SHRAVAN VEERAPANENI, NYU, YUAN-NAN YOUNG, NJIT, PETIA VLAHOVSKA, Brown University, JERZY BLAWZDZIEWICZ, Texas Tech University — The dynamics of compound vesicle (a lipid bilayer membrane enclosing a fluid with a suspended particle) in shear flow is investigated using both numerical simulations and theoretical analysis. We find that the non-linear coupling (via hydrodynamic interaction) between the inclusion motion and the confining membrane deformation gives rise to new features in the vesicle dynamics. Transition from tank-treading to tumbling can occur even in the absence of any viscosity mismatch. An initially non-concentric inclusion induces transient vesicle waltzing. A swinging-like vesicle motion is observed if the enclosed particle is an ellipsoid. The rheology of a suspension of compound vesicles is also strongly affected by the inclusion confinement. Our results highlight the complex effects of internal cellular structures on cell dynamics in external flow.

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