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Axisymmetric rotational slow viscous flows around asymmetric fused dumbbells D. PALANIAPPAN, Texas A&M University, Corpus Christi — Symmetric rotational viscous flows involving fused dumbbells are considered in the limit of low-Reynolds numbers. The boundary of the rigid dumbbell is formed by two spherical surfaces of arbitrary radii, a and b respectively, intersecting at a vertex angle, say $\frac{\pi}{n}$, n an integer. Analytic solutions are obtained for the asymmetric configuration submerged in (i) a rotational flow, and (ii) a rotlet induced flow field. The image system in each case is found in terms of fundamental solutions of the Stokes flow equations. Exact expressions for the torque/couple acting on the dumbbell are computed directly from our singularity solutions. It is found that the radii of the spheres, the center-to-center distance, the vertex angle together with the location of the initial rotlet dictate the flow fields and the torque. Upper and lower bounds for the couple acting on the asymmetric dumbbell are determined as well. Our method is based on the successive reflection theory and avoids the use of complex toroidal and meromorphic functions. The utility of the toroidal frame for the axisymmetric rotational flow in the case of arbitrary vertex angle is also discussed. However, for the rotlet flow, there does not appear to be any technique available other than the one provided here.

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