Rotation-translation hydrodynamic coupling of a particle in a gradient of viscosity NAOMI OPPENHEIMER, Princeton University, SHAHIN NAVARDI, Texas Tech University, HOWARD STONE, Princeton University — We study the translation-rotation hydrodynamic coupling of spherical particles in Stokes flow where there are gradients of viscosity. In particular, we examine cases in which symmetry is broken by temperature gradients in the fluid. Using the Lorentz reciprocal theorem, we derive analytical expressions for the coupling tensor when the viscosity variations caused by the temperature gradients are small. We examine two cases. In the first, the temperature gradient is external and the particle moves perpendicular to it. In the second the translating object is a Janus sphere that creates its own local temperature gradient. We find that in the first case, translation induces rotation, and in the second it suppresses it. Our results may illuminate recent experimental results of Janus particles activated by light.

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