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Xiang Xu* (xuxiang@andrew.cmu.edu), Carnegie Mellon University, Wean Hall 6113, Pittsburgh, PA 15213, and **Hao Wu**. *Global regularity and stability of a hydrodynamic system modeling vesicle and fluid interactions.*

In this paper, we study a hydrodynamical system modeling the deformation of vesicle membranes in incompressible viscous fluids. In the three dimensional case, we prove the existence/uniqueness of local strong solutions for arbitrary initial data as well as global strong solutions under the large viscosity assumption. We also establish some regularity criteria in terms of the velocity for local smooth solutions. Finally, we study the stability of the system near local minimizers of the elastic bending energy. (Received August 27, 2012)