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(Dated: January 19, 2021)

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I. INTRODUCTION

A. Hydrophobic Attraction Potential

$$\Phi(\Omega, f) = \gamma \min_{u \in \mathcal{A}} I[u], \tag{1}$$

$$I[u] = \int_{\Omega} \rho |\nabla u|^2 + \rho^{-1} u^2 \, dx. \tag{2}$$

$$\mathbf{T} = \gamma \rho^{-1} u^2 \mathbf{I} + 2\rho\gamma(\tfrac{1}{2}|\nabla u|^2 \mathbf{I} - \nabla u \otimes \nabla u), \tag{3}$$

$$\begin{cases} -\rho^2 \Delta u + u = 0 & \text{in } \Omega, \\ u(x) = f(x) & \text{on } \Sigma, \\ u(x) \to 0, & \text{as } x \to \infty. \end{cases} \tag{4}$$

B. Nondimensionalizations

$$\chi = \dot{\gamma} \cdot \frac{\mu R_0^2}{\kappa} \tag{5}$$

II. MOBILITY PROBLEM

$$-\Delta \mathbf{U} + \nabla P = 0 \qquad \text{in } \Sigma \tag{6}$$
$$\nabla \cdot \mathbf{U} = 0 \qquad \text{in } \Sigma \tag{7}$$
$$\mathbf{U}(\mathbf{x}) \to \mathbf{u}_\infty \quad \text{as} \quad |\mathbf{x}| \to \infty \tag{8}$$

$$\begin{aligned} \mathbf{v}_i + & \omega_i \times (\mathbf{x} - \mathbf{a}_i) \\ &= -\frac{1}{2}\sigma_{hyd}(\mathbf{x}) + D[\sigma_{hyd}](\mathbf{x}) \\ &\quad - \sum_{i=1}^{N} \big(\mathbf{S}(\mathbf{x}, \mathbf{a}_i)\mathbf{F}_i + \mathbf{R}(\mathbf{x}, \mathbf{a}_i)\tau_i\big) + \mathbf{u}_\infty, \quad \mathbf{x} \in \Gamma \end{aligned} \tag{9}$$

$$\int_{\partial M_i} \sigma_{hyd} \cdot \mathbf{n} ds = \mathbf{0} \tag{10}$$

$$\int_{\partial M_i} \sigma_{hyd} \times (\mathbf{x} - \mathbf{a}_i) \cdot \mathbf{n} ds = \mathbf{0} \tag{11}$$

where

$$\begin{aligned} \mathbf{S}(\mathbf{x}, \mathbf{a}) &= \frac{1}{4\pi}\left(-\log \rho \mathbf{I} + \frac{\mathbf{r} \otimes \mathbf{r}}{\rho^2}\right), \quad \text{and} \\ \mathbf{R}(\mathbf{x}, \mathbf{a}) &= \frac{\mathbf{r}^\perp}{4\pi\rho^2}, \\ \mathbf{r} = \mathbf{x} - \mathbf{a} & \quad \text{and} \quad \rho = |\mathbf{r}| \end{aligned} \tag{12}$$

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* A footnote to the article title

III. INTEGRAL EQUATION METHOD

A. Short Range Repulsion

IV. NUMERICAL RESULTS

A. Tank-Treading Vesicles

B. Membrane Ruptures

V. CONCLUSION

ACKNOWLEDGMENTS

Appendix A: Appendixes