

Accepted Manuscript

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PII: S0021-9797(16)30431-3
DOI: <http://dx.doi.org/10.1016/j.jcis.2016.06.066>
Reference: YJCIS 21376

To appear in: *Journal of Colloid and Interface Science*

Received Date: 14 March 2016
Revised Date: 26 June 2016
Accepted Date: 28 June 2016



Please cite this article as: A. Musin, R. Grynyov, M. Frenkel, E. Bormashenko, Self-Propulsion of a Metallic Superoleophobic Micro-Boat, *Journal of Colloid and Interface Science* (2016), doi: <http://dx.doi.org/10.1016/j.jcis.2016.06.066>

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Self-Propulsion of a Metallic Superoleophobic Micro-Boat

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Contains ESI (1 movie):

Abstract

The self-propulsion of a heavy, superoleophobic, metallic micro-boat carrying a droplet of various aqueous alcohol solutions as a fuel tank is reported. The micro-boat is driven by the solutocapillary Marangoni flow. The jump in the surface tension owing to the condensation of alcohols on the water surface was established experimentally. Maximal velocities of the self-propulsion were registered as high as 0.05 m/s. The maximal velocity of the center mass of the boat correlates with the maximal change in the surface tension, due to the condensation of alcohols. The mechanism of the self-locomotion is discussed. The phenomenological dynamic model describing the self-propulsion is reported.

Keywords: self-propulsion; Marangoni flow; superoleophobic boat; surface tension.

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