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Effect of drop shape on thermally-induced drop motion at the free interface of immiscible liquid layers EHSAN YAKHSHI TAFTI, HYOUNG J. CHO, RANGANATHAN KUMAR, University of Central Florida — Drops at the air interface of immiscible liquids (water on oil) usually form partially-submerged lens shapes. When a lateral thermal gradient is maintained along the surface, such drops move in the direction of decreasing temperatures, as reported in earlier studies. We show that in addition to the lens configuration, it is possible to create spherical (ball-shaped) drops at the interface. Unlike lens-shaped drops, such spherical drops migrate towards warmer regions; i.e. direction of increasing temperatures. Opposite direction of thermally induced motion for drops at the free surface of immiscible liquids is explained based on drops shape and the dynamics of the underlying liquid film subject to a thermal gradient; mainly deformation of the free surface, and the development of an outward moving (hot to cold) flow at the free interface. The proposed physical models predict experimental results satisfactorily. Thermocapillary motion of drops on liquid platforms is ideal for biochemical Microsystems and Lab-on-chip applications where droplets can be transported faster, with higher level of controllability and with less thermal loading of drops as compared to using solid substrates. In addition, other disadvantages of using dry surfaces such as drop evaporation, contamination, and surface pinning are avoided.

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