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Capillary forces on elastic solids measured in molecular dynamics
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Milieux Hétérogènes, ESPCI, Paris, JACCO H. SNOEIJER, Physics of Fluids, Uni-
versity of Twente, Enschede — The distribution of capillary forces that a liquid drop
exerts on a solid substrate is still debated. While the force normal to the interface
can be derived from a global argument, this is not the case for the tangential force
component. Experiments in which the force is derived from the elastic deformation
of the solid are difficult to perform and interpret, and have lead to different conclu-
sions. To resolve this issue, we directly measure the force in Molecular Dynamics
simulations of Lennard-Jones droplets in contact with a solid at varying contact
angles. We find that the tangential force component is always pointed towards of
interior of the drop, and can qualitatively be explained by density functional theory
with the sharp kink approximation. This contradicts the classical view the that the
capillary force on the solid acts parallel to the liquid interface.

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