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The Effect of Nanobubbles on Microcantilever Bending SANGMIN JEON, Pohang University, RAMYA DESIKAN, University of Tennessee, FANG TIAN, THOMAS THUNDAT, Oak Ridge National Laboratory — Nanomechanical cantilevers are very small and extremely sensitive force and mass sensors. Here, we report on the impact of the vertical component of surface energy on microcantilevers when nanobubbles form on their surfaces. Young's equation, which is commonly used to determine the contact angle of liquid drops on a solid surface, ignores the vertical component of the surface energy. Despite this force being extremely small and its effect on the solid can be ignored, it plays a significant role for flexible surfaces such as microcantilevers. A gold-coated silicon microcantilever and a dodecanethiol coated silicon microcantilever were used to detect real-time formation of nanobubbles on their surfaces when exposed to air-rich water. As air nanobubbles form on the surfaces of the cantilever, the cantilever undergoes bending and we relate this to the vertical component of surface energy in Young's equation. This implies that the vertical component of the surface tension should be considered for flexible solid surfaces, and the formation of nanobubbles should be avoided when cantilevers are used as sensors to avoid artifacts.

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