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Electrowetting on Semiconductors CESAR PALMA, ROBERT DEEGAN, University of Michigan — In traditional electrowetting-on-dielectric (EWOD) a sessile drop rests on a thin dielectric separating it from a conductor. A voltage applied between the droplet and the conductor causes an increase in the solid-liquid interface area and a concomitant reduction of the contact angle. The change in the contact angle is well modeled by the Young-Lippmann equation. Here we report experiments where the conductor is replaced by lightly-doped, single-crystal silicon. We observe contact angle changes that are polarity-dependent as well as a non-reversible light-induced wetting transition. As suggested previously we assume that the charge distributions in the system have a direct analogue with the charges states of a metal-oxide-semiconductor capacitor. We calculate the free energy of the system taking into account both capillary and electrostatic contributions. By minimizing this result we derive a modified form of the Young-Lippmann equation. We further enhance our model to include the effect of pinning and well known semiconductor surface effects including interface charges and work function differences. We find that this model works well with experimental results.

Cesar Palma
University of Michigan

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