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Dynamic Electrowetting-on-Dielectric (DEWOD): From Ab-initio to Macroscale Modeling.[1] FARZAD MASHAYEK, VITALIY YURKIV, ABHILASH SANKARAN, JINGWEI WU, ALEXANDER YARIN, University of Illinois at Chicago — In this contribution, we present the results of a combined density functional theory (DFT) calculations of water adsorption on dielectric surfaces and the phase-field modeling (PFM) of droplet impact and spreading. The DFT calculations are performed using VASP (Vienna Ab initio Simulation Package) code whereas the PFM is developed in Comsol Multiphysics software package employing phase-field, laminar flow and electrostatics modules. The DFT calculations are performed to reveal the dominant water adsorption sides, energetics and the electron density profile on Teflon and parafilm surfaces. The PFM macroscopic calculations are performed to model water droplet impact onto a dielectric hydrophobic Teflon and parafilm surface. Three cases of droplet impact are studied, namely, the impact onto a surface with no voltage applied, and the impacts onto the surfaces with 8.5 kV and 10 kV applied. The modeling results are directly compared to our own experimental measurements of droplet impact onto Teflon and Parafilm surface without and with an applied voltage as well as static contact angle measurements.

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