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Droplet manipulation to detect surface tension SANLI MOVAFAGHI, WEI WANG, ARI METZGER, DESIREE WILLIAMS, JOHN WILLIAMS, ARUN KOTA, Colorado State Univ — Recent years have witnessed a significant spike in manipulation of liquid droplets because of their applications in microfluidic diagnostics, drug discovery etc. Particularly, droplet manipulation on super-repellent surfaces has been widely studied using various methods. However, to the best of our knowledge, there are no studies that employ super-repellent surfaces to sort droplets based on surface tension. In this work, we synthesized tunable superomniphobic surfaces with fluorinated, flower-like TiO₂ nanostructures. We demonstrate that the surface chemistry, and consequently the solid surface energy of our superomniphobic surfaces can be tuned using UV irradiation. This allows us to systematically tune the mobility of droplets with different surface tensions on our superomniphobic surfaces. Each of these surfaces with same surface texture, but different solid surface energy allows certain high surface tension liquid droplets to freely roll past the surface while “trapping” other low surface tension liquid droplets. Leveraging this selective mobility of droplets based on their surface tension, we fabricated a simple device with precisely tailored discrete surface energy domains that can sort droplets by their surface tension. We envision that our droplet sorting device will enable inexpensive analytical devices for personalized point-of-care diagnostic platforms.

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