Surface nanodroplets show their spots

A solid's surface properties can be significantly modified by molecularly thin adsorbed layers, or adlayers, of organic compounds from the surrounding environment. Ke Xu and his group at the University of California, Berkeley, have developed an optical approach that can detect adlayers' nanoscale structure and composition, with a spatial resolution of 30 nm. The new superresolution technique works by immersing the sample in a dilute solution of dye molecules that fluoresce only while in the adlayer phase. Recording the images and spectra of fluorescent bursts from molecules diffusing in and out of adlayers unveils unexpectedly rich surface phenomena at the nanoscale.

In one application of their technique, the researchers found that an adlayer mixture of trichloroethylene and chloroform, two miscible solvents, spontaneously demixes on a glass surface into nanodroplets of varying compositions and sizes. As shown in this false-color image of a 25 μm × 32 μm region, the droplets, with diameters of 30–400 nm, are well resolved; the color scale, from violet to red, corresponds to fluorescence peaks from 620 nm to 638 nm. Those spectral differences are due to the dye's fluorescence being sensitive to the local polarity of the surrounding organic molecules. Violet dots are pure trichloroethylene; red, pure chloroform; and in-between colors, mixtures in various ratios. (L. Xiang et al., *Nat. Commun.* **9**, 1435, 2018; image submitted by Ke Xu.) —RJF

TO SUBMIT CANDIDATE IMAGES FOR BACK SCATTER, VISIT http://contact.physicstoday.org.