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Liquid domains of lipid monolayers on the surface of oil-in-water emulsions LEA-LAETITIA PONTANI, DYLAN BARGTEIL, MARTIN HAASE, JASNA BRUJIC, New York University, BIOPHYSICS AND JAMMING TEAM — Immiscible lipids spontaneously decompose into domains, both in cellular membranes and monolayers of amphiphilic films. Here we show that they also form on the surface of oil in water droplets, produced by a microfluidic device. In this case, curvature induced instabilities are balanced by surface tension to produce diverse surface morphologies, such as spots, stripes and hemispheres. Surprisingly, the ternary phase diagram shows that these structures are present even in binary mixtures and can be stable over weeks. We investigate the origin of domain stability by tuning the parameters of the forces that play a role in this process, such as the electrostatic repulsion between the domains, the surface tension of each phase or the size, i.e. the curvature of the droplets. Understanding those mechanisms will not only shed light on the physics of lipid domains in biological membranes but will also allow us to tune this stability to produce droplets with a given number of patches that can then be functionalized for self-assembly with controlled valency.

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