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Spontaneous Pattern Formation of Surface Nanodroplets from Competitive Growth DETLEF LOHSE, University of Twente, SHUHUA PENG, XUEHUA ZHANG, RMIT, Melbourne — Nanoscale droplets on a substrate are of great interest because of their relevance for droplet-based technologies for light manipulation, lab-on-chip devices, miniaturised reactors, encapsulation and many others. In this work, we establish a basic principle for the symmetrical arrangement of surface nanodroplets during their growth under simple flow conditions. In our model system, nanodroplets nucleate at the rim of spherical cap microstructures on a substrate, due to a pulse of oversaturation is supplied by a solvent exchange process. We find that, while growing at the rim of the microcap, the nanodroplets self-organise into highly symmetric arrangements, with respect to position, size, and mutual distance. The angle between the neighbouring droplets is four times the ratio between the base radii of the droplets and the spherical caps. We show and explain how the nanodroplets acquire the symmetrical spatial arrangement during their competitive growth and why and how the competition enhances the overall growth rate of the nucle- ated nanodroplets. This mechanism behind the nanodroplet self-organisation promises a simple approach for the location control of droplets with a volume down to attoliters.

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