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Spontaneous Pattern Formation of Surface Nanodroplets from Competitive Growth SHUHUA PENG, RMIT University, Melbourne, Australia, DETLEF LOHSE, University of Twente, XUEHUA ZHANG, RMIT University, Melbourne, Australia, XUEHUA ZHANG TEAM, DETLEF LOHSE COLLABORATION — 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, as a pulse of oversaturation is supplied by a solvent exchange process. We find that, while growing, 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 nucleated 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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