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Geometrical frustration and correlated capillary instabilities among concentric polymer toroids ZHENG ZHANG, Univ of Colorado - Boulder, GENE HILTON, National Institute of Standards and Technology, YIFU DING, Univ of Colorado - Boulder — We present the first study on the simultaneous capillary instability among concentric viscous toroids. An array of concentric polystyrene (PS) toroids were lithographically fabricated with a constant radial spacing between neighboring toroids. The toroids were confined in a poly (methyl methacrylate) (PMMA) matrix. PS and PMMA were used because of their immiscibility and well-characterized physical properties. The glass transition temperature (T_g) of the pattern are well above room temperature. We found that the radial contraction mode of toroids (Pairam & Fernández-Nieves, PRL 2009) was inhibited due to substrate confinement. Upon further annealing, the toroids ruptured along the circumferential direction at a finite wavelength. Depending on the relative volume of PS, the rupture behavior of each toroid (with different aspect-ratios) can be non-correlated or correlated radially. In the correlated case, geometric frustration due to the toroidal curvature was observed, which led to an intriguing branching behavior in the correlated instability and closely resembles a Cayley tree with fractal coordination number of 3.

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