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Frank Kaspar Phases of Block Copolymers and the Kelvin Problem: Is it all about Area? GREGORY GRASON, MICHAEL BUCKLEY, ABHIRAM REDDY, University of Massachusetts Amherst — Observations and predictions of Frank Kaspar phases of spherically-ordered assemblies of amphiphillic molecules, and block copolymers in particular, continue to beg questions about the physical mechanisms that stabilize complex symmetries, like the A15 or σ lattices. In this talk we revisit previous heuristic and quantitative arguments about the role of lattice symmetry, and the geometry of Voronoi cells in particular, in selecting the minimal free energy packings of "squishable" spherical domains. We focus on what might be called a "diblock foam model that maps the free energy of competing sphere phases directly onto two geometric moments of the cell distributions, the reduced area and the moment of inertia, which measure the respective costs of inter-domain repulsions and entropic stretching of constituent chains. Surface Evolver optimizations of the this purely geometric model are performed for BCC, A15, σ and a broader array of competing Frank Kasper structures. These results, which we compare to SCFT studies, shed a critical light on the relative importance of optimal area vs. optimal stretching vs. optimal volume partitioning among cells in selecting among complex sphere phases, and further, suggests previously unstudied candidate phases.

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