On the propensity of inverse patchy colloids to form planar structures

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Inverse patchy colloids (IPCs) are patchy particles with differently charged surface regions¹. These features characterize experimental model systems² as well as naturally occurring systems, such as proteins and virus capsids. I will present several IPC systems with two identical polar patches and I will show that, as a consequence of the intricate balance between attractions and repulsions, IPCs tend to form planar aggregates either as monolayers closed to a charged substrate³ or as bulk equilibrium phases⁴,⁵.

Among the emerging lamellar architectures formed by IPCs, I will focus on a new structure (see the figure) where the particle layers are separated by inter-layer monomers with a very specific order and behavior⁵. This hybrid crystal-liquid phase is able to spontaneously assemble in bulk simulations and maintains its stability over a surprisingly large temperature range.

2. ACS Nano 7, 4657 (2013)
3. NANO letters 14, 3412 (2014)