Polypeptoid self-assembles into nanotubes

Hydrophobic and hydrophilic polymer blocks align and polymer chains stack up to form novel materials

By Stu Borman

A study shows that diblock copolymers made from peptide analogs called peptoids can stack together in a novel way to form crystalline nanotubes. Ronald N. Zuckermann of Lawrence Berkeley National Laboratory and coworkers created the new class of nanotubes by synthesizing diblock copolymers containing same-sized blocks of hydrophilic (ethyleneoxy side-chain) and hydrophobic (decyl side-chain) poly(N-substituted glycines).

The peptoid chains form rings that stack vertically, with the hydrophilic and hydrophobic blocks aligning with one another, by a not-yet-understood mechanism, to form nanotubes with amphiphilic interior and exterior surfaces (Proc. Natl. Acad. Sci. USA 2016, DOI: 10.1073/pnas.1517169113). Self-assembling nanotubes have been prepared before by mechanisms involving hydrogen bonding, electrostatic, or \( \pi-\pi \) interactions. But the new ones do not form via any of those mechanisms. The researchers hope to learn how they do form, as well as determine their atomic-resolution structure, cross-link them to make them stronger, and functionalize them to assess potential applications. Chemical separations are one possible use. Virgil Percec of the University of Pennsylvania comments that “these unprecedented tubular structures could provide new applications that are not accessible by already known biological and synthetic tubular assemblies.”