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Bioinspired DNA origami capsids

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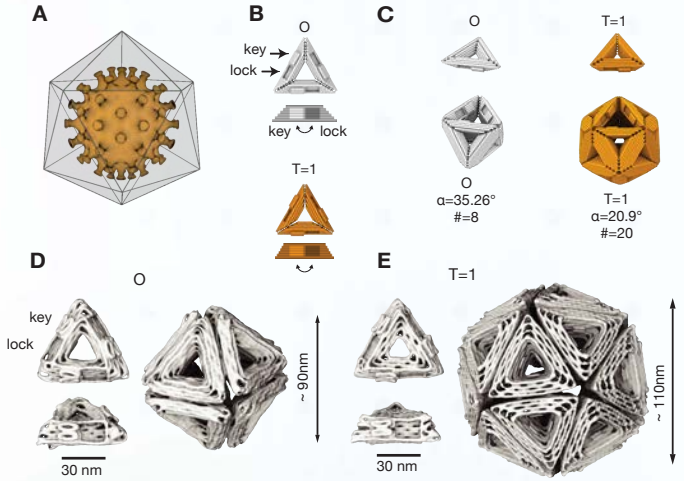
DNA origami technology is used to develop building blocks that self-assemble into predetermined finite-sized structures. The objectives of this research are to understand, control, and build self-closing structures inspired by self-assembling viruses, whose smallest capsids have an icosahedral symmetry and are decomposable into so-called “quasi-equivalent” triangular subunit arrangements, characterized by the “T” number. Assembly occurs using programmed edge-edge interactions based on a lock-and-key mechanism and base stacking between the blunt ends of the double-helices. Researchers have successfully designed, assembled and characterized capsids of octahedral and icosahedral symmetry. A potential application is to encapsulate viruses within a shell and therefore deactivate them.



DNA origami shells. (**A**) The concept is to encapsulate covid-19 in a DNA origami shell to deactivate virus. (**B**) Cylindrical model of DNA-origami triangle constructed using a single circular 8064 base scaffold. The edges of the triangles are beveled and modified with shape-complementary protrusions (light) and recesses (dark) that guide assembly via “lock” and “key” interactions into octahedra (O) and icosahedra (T=1). (**C**) Octahedral and icosahedral shells formed by the triangles shown in (B). For each shell design, one of its monomers has been removed. α is the bevel angle of the sides, # the number of DNA-origami triangles building the shell. (**D, E**) High resolution cryo-EM images of the octahedral (D) and icosahedral (E) monomers and capsids.

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