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Tailored protein encapsulation into a DNA host using geometrically organized supramolecular interactions

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The self-organizational properties of DNA have been used to realize synthetic hosts for protein encapsulation. However, current strategies of DNA–protein conjugation still limit true emulation of natural host–guest systems, whose formation relies on non-covalent bonds between geometrically matching interfaces. Here, we report one of the largest DNA–protein complexes of semisynthetic origin held in place exclusively by spatially defined supramolecular interactions. Our approach is based on the decoration of the inner surface of a DNA origami hollow structure with multiple ligands converging to their corresponding binding sites on the protein surface with programmable symmetry and range-of-action. Our results demonstrate specific host–guest recognition in a 1:1 stoichiometry and selectivity for the guest whose size guarantees sufficient molecular diffusion preserving short intermolecular distances. DNA nanocontainers can be thus rationally designed to trap single guest molecules in their native form, mimicking natural strategies of molecular recognition and anticipating a new method of protein caging.

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New nanocomposite materials for display screens based on light scatering

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It is considered a method of synthesis of new polymeric materials providing the high quality optical contact between two planar waveguides contacted mechanicaly. The method is based on the silicate nanoparticles insertion into the polymer matrix by intermediary elements. Materials providing the high quality reversible optical contact can be used in data entry systems with optical encoding (for example, keyboards, mobile phones accessories). In such systems, detection of touchpad's pressure points is performed by recording the optical signal rolling from one optical fiber to another during the appearance of optical contact. Butylmethacrylate (BMA), and 2-ethylhexyl acrylate (EHA), Aldrich, without further purification, as well as dinitrile azo-bis-izomaslyannoy acid (AIBN) , Aldrich are used for synthesis of polymers which provide the optical contact between the polymer film and polymethylmethacrylate plate. EGA component is inserted into copolymer to improve adhesion of the film to the polymethylmethacrylate. Copolymers of butyl methacrylate and 2-ethylhexyl acrylate were synthesized by free radical copolymerization with AIBN as initiator. Polymerization was in solution of tetrahydrofuran. Cationic modifying compounds obtained by alkylating 2- (dimethylamino) ethyl methacrylate with benzyl bromide in solution of tetrahydrofuran were used for silicate nanoparticles (Products and Nanocor Cloisite 20A - Southern Clay) insertion into the investigated films. It is necessary to use a modifier because the clay Nanocor (substance that ensures the presence of nanoparticles) is natural layered silicate, or rather natural -montmorellonit Na + (MMT), which is hydrophilic and can not be mixed with the polymers on the molecular level. Special unit to record the amplitude of the optical signal as a function of the applied load is used to determine the quality of optical contact. The results showed that the composite materials have appropriate properties to implement optical sensor systems. More precisely, the optical contact appears only at sufficiently high mechanical pressure, and it corresponds to the realization of keyboards (pressure by user's fingers). This can greatly simplify the scheme of keyboards and other sensor systems with optical encoding..

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