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Viral-electromechanical systems: Virus derived sensing and actuating systems

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Virus based materials have been widely adapted to sensing systems by virtue of their exquisite biomolecular selectivity. While several approaches have been implemented for 2D coating of viruses, until now the 3D fabrication of virus based devices has not yet been achieved. Utilizing a unique strategy for controlled extrusion of filamentous virus, we have demonstrated the ability to form nano to micro scale actuating and sensing systems comprised primarily of aligned viruses. The ability to form complex 3D structures including cantilevers, bridges, and pillars among others has allowed us to generate electrostatic actuating devices as well as dynamic resonating systems using this virus based microfabrication approach. Moreover, we find a variety of interesting surface modes that can be generated as textures on the nano/microsystems including smooth, undulating, and helical surface modes. We expect the ability to easily genetically or chemically modify the filamentous virus with functional or selective motifs will initiate a new class of virus-based electromechanical systems with particular value to the next generation of sensing systems.

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