Versatile bottom-up approach to nanostructured solar cells

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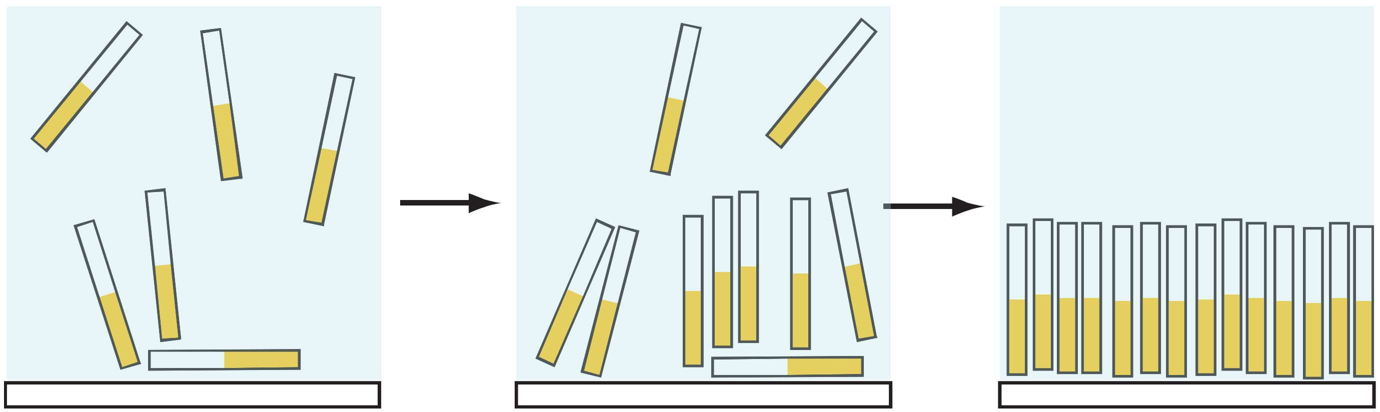
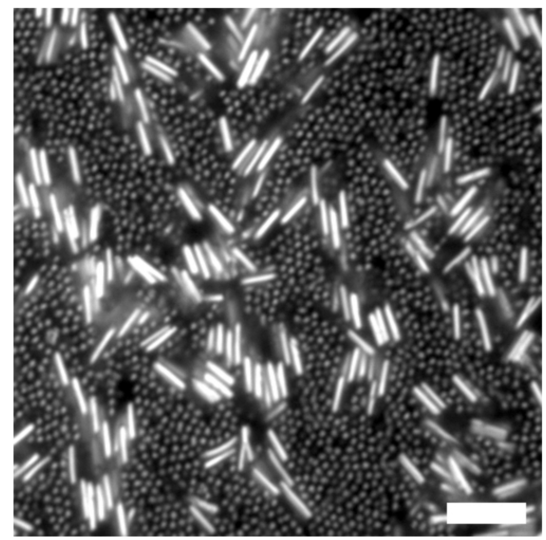
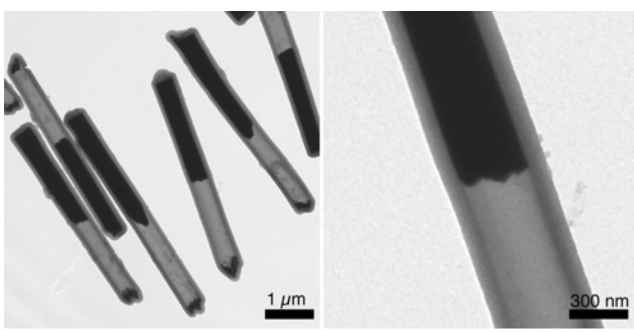
We have developed a novel method of creating vertically-aligned nanowire structures; wherein, assembly is directed by the inherent offset center of mass within multisegment particles. These structures hold promise as solar harvesting devices. We have examined the self-assembly of these structures to determine optimum assembly conditions and have worked to expand the materials studied to be applicable to energy conversion.



Schematic of the assembly process. As nanowires deposit from solution, they diffuse across the surface and rotate perpendicular to it. With increasing numbers of neighbors, "standing" particles become stabilized and form a columnar array.



Inverted optical reflectance micrographs showing assembled nanoparticles on an open surface (left) and within a microwell (right). Points indicate standing wires; lines indicate laying wires. Scale bar is 5 μm.



Transmission electron micrographs of partially etched nanowires. The black segments are Au with the lighter gray being a silica coating. The small dark ends of the wires are Au caps to prevent premature etching.