Guided Three-dimensional Molecular Self-assembly on Silicon Substrates

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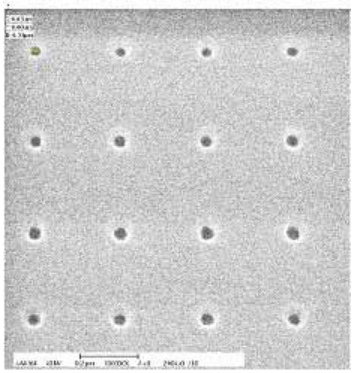
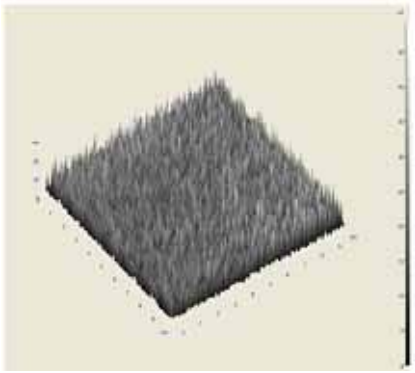
We demonstrate three-dimensionally (3D) self-assemble growth of the metallothionein (Mn,Cd-MT-2) molecules on patterned semiconductor substrates. The MT molecules deposited on the patterned substrates were found to grown into 3D rod or ring type nanostructures, depending on the shape of patterned nanostructures on the substrates. Dense arrays of 3D molecular nanorods or rings with an area density close to 1010 cm-2 were demonstrated with a pore size of 20 nm and a pitch size of 100 nm. Those engineered molecular nanostructures provide an excellent opportunity for biological applications, sensing sources of new nano-devices, biochemical reactions on surfaces and even single molecule studies.



Left: SEM images of patterned nanopores on the Si substrate



Right: AFM images of the dense molecular self-assembly arrays with a density of approximately 10^{10} cm^{-2}. The molecules have self-assembly grown into a rod shape.

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