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## Bioinspired CuO Hierarchical Nanostructures for Self-cleaning surfaces and SERS substrates

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Bioinspired hierarchical nanostructures for self-cleaning surface and SERS substrates are investigated. The multi-level hierarchy is combined with CuO nanowire and additional nanoscale structures. CuO nanowire, which has extremely high aspect ratio, serves as a base structure of multi-level hierarchy and additional flower like structures are placed on the CuO nanowires. Since as-fabricated CuO nanostructures are hydrophilic, the surface is coated with perfluorooctyltrichlorosilane in order to change its wetting property to hydrophobic. While those CuO based nanostructures have a sufficient roughness for superhydrophobic characteristics, hierarchical nanoflowers on nanowire structures lead to a self-cleaning surface. Furthermore, flower like nanostructures provide reentrant curvatures, thus enabling oleophobic property. The surfaces has a repellency even for a tiny droplet (10 nL) of low surface tension liquids (~35 mN/m). On the other hands, nanoflowers provide many number of nanoscale gaps. After a thin layer of silver is deposited on the surface of CuO nanostructures, those nanoscale gaps act as hot-spot for surface enhanced Raman scattering (SERS). To analyze SERS enhancement of the surfaces, Raman shift is measured with varying molar density of 4-Mercaptopyridine from mM to pM. From these results, hierarchical CuO nanostructures are suitable for self-maintenance and cost effective SERS sensing applications.

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