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Title **Micromotors driven by UV light based on advanced hybrid GaN/ZnO nanoarchitectured microtubes**

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Description EN

Functional microstructures with designed hierarchical and complex morphologies and large free active surfaces based on novel hybrid nanoarchitectured GaN/ZnO microtubes with an outer hydrophobic GaN surface and an inner hydrophilic surface of chemically stabilized ZnO decorated by solid solution $(Ga_{1-x}Zn_x)(N_{1-x}O_x)$ NWs, which are terminated by co-catalyst AuGa-alloy nanodots have been developed and characterized. The presence of an epitaxially stabilized and chemically extremely stable ultrathin layer of ZnO on the inner wall of the produced GaN microtubes is evidenced. Gold nanoparticles initially trigger the catalytic growth of solid solution phase $(Ga_{1-x}Zn_x)(N_{1-x}O_x)$ nanowires into the interior space of the microtube, which are found to be terminated by AuGa-alloy nanodots coated in a shell of amorphous GaO_x species after the hydride vapor phase epitaxy process. As a proof of concept, the produced microtubes are used as photocatalytic micromotors in the presence of hydrogen peroxide solution with luminescent properties, which are appealing for future environmental applications and active matter fundamental studies. Our experiments show intense photocatalytic reactions under UV light excitation in the presence of hydrogen peroxide exclusively for microtubes functionalized with gold nanodots. It has been demonstrated that two microtubes with the lengths of 32 μm and 4.6 μm, and diameters of 2 μm and 0.9 μm, exhibit average velocities of UV-light driven motion of 1.4 μm/s and 5.5 μm/s with switchable on–off capability. The developed micromotors are promising for sensing applications, e.g., by monitoring the fluorescence quenching
in the presence of a certain analyte, or environmental cleaning by the degradation of organic pollutants by photocatalytic reactions.
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