Regeneration of underwater superhydrophobic hierarchical ZnO/Si surfaces by PEC water splitting

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The diffusion of gas pockets into the water reduces lifetime in underwater superhydrophobic surfaces. To overcome this limited lifetime of underwater superhydrophobicity, this study introduces a novel method for regenerating a continuous air interlayer on superhydrophobic ZnO nanorod/Si micropost hierarchical structures (HRs) via the combination of two biomimetic properties of natural leaf: superhydrophobicity from the lotus leaf effect and solar water splitting from photosynthesis. The designed p-n junction in the ZnO/Si HRs allowed for highly stable gas interlayer in water and regeneration of the underwater superhydrophobicity due to the unique ability of the surface to capture and retain a stable gas layer. The developed regenerative method is expected to broaden the range of potential applications involving superhydrophobic surfaces and to create new opportunities for related technologies.