# Ultralight Programmable Bioinspired Aerogels with Integrated Multifunctionalities via Co-assembly

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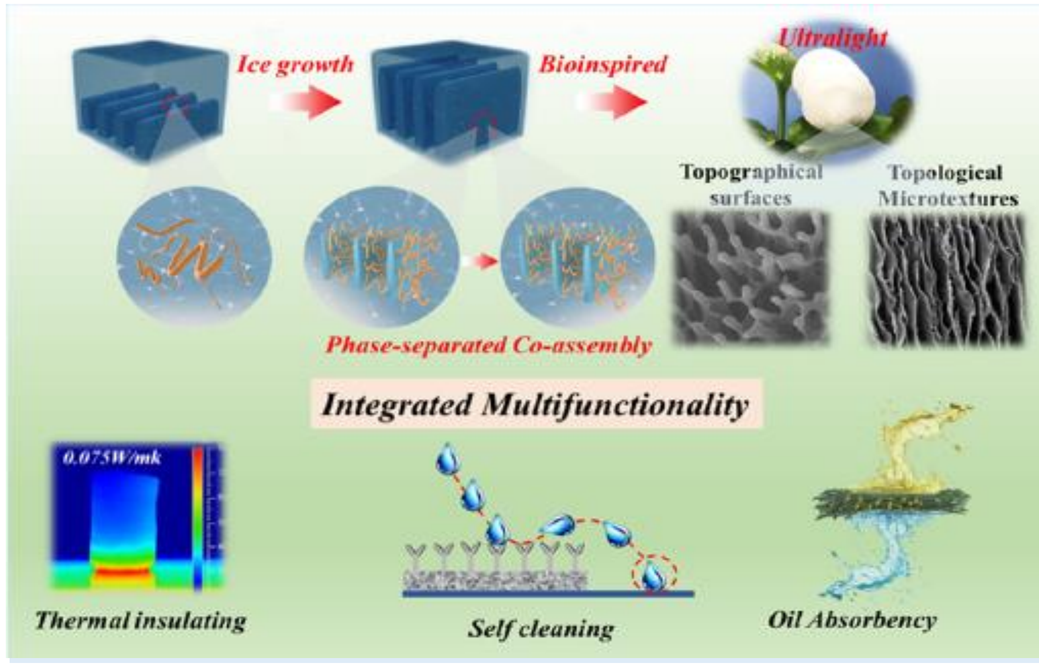
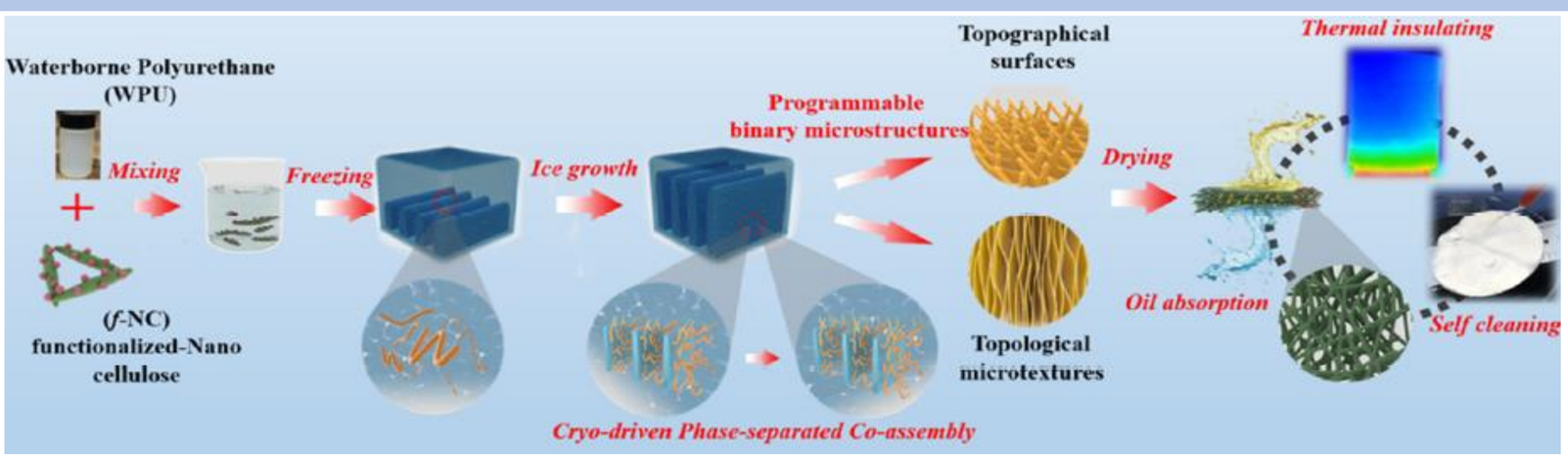
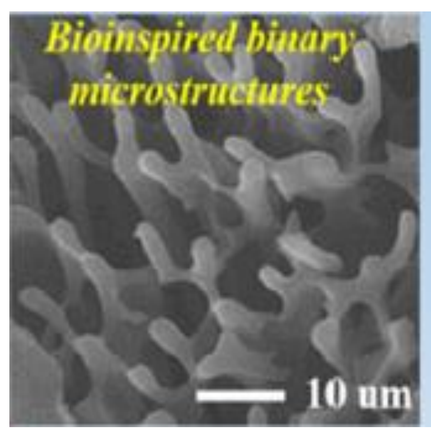
## Introduction

By introducing the binding groups for hydrophobicity tailoring, functionalized nanocellulose (f-NC) is prepared via mechanochemistry as a structural, functional, and topographical modifier for multitasking role. The self-generated bioinspired surface with f-NC greatly maintain structural unity and mechanical robustness, which enable self-adaptability and self-supporting of surface configurations. With fine-tuning of nucleation-driving, the binary microstructures can be controllably diversified for structure-adaptable multi-functionalities. The resulting ultralight Salvinia minima-inspired aerogels (e.g., 0.054 g cm-3) presented outstanding temperature-endured elasticity (e.g., 90.7% high-temperature compress-recovery after multiple cycles), durable superhydrophobicity and anti-icing properties, oil absorbency efficiency (e.g., 60.2 g g-1), thermal insulating (e.g., 0.075 W mk-1), which are superior to these reported on the overall performance.



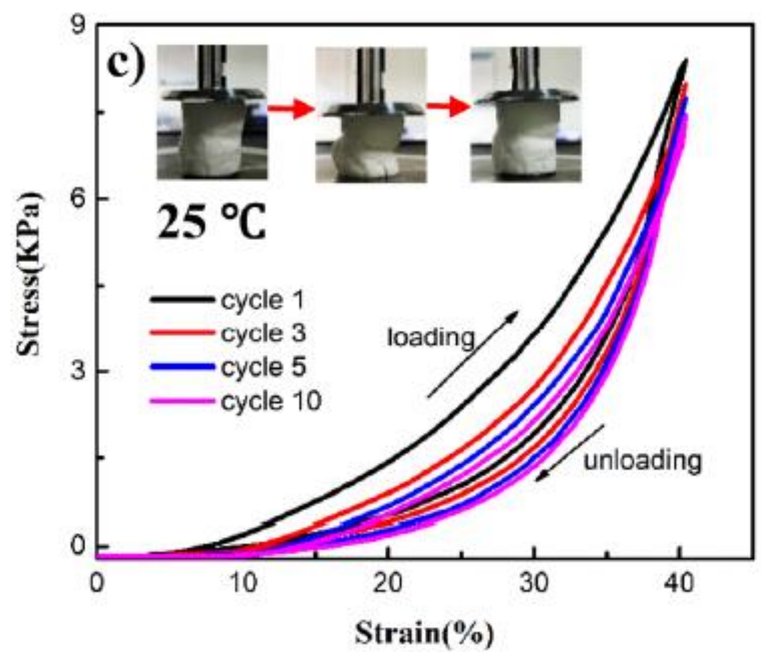

## Assembly Strategy

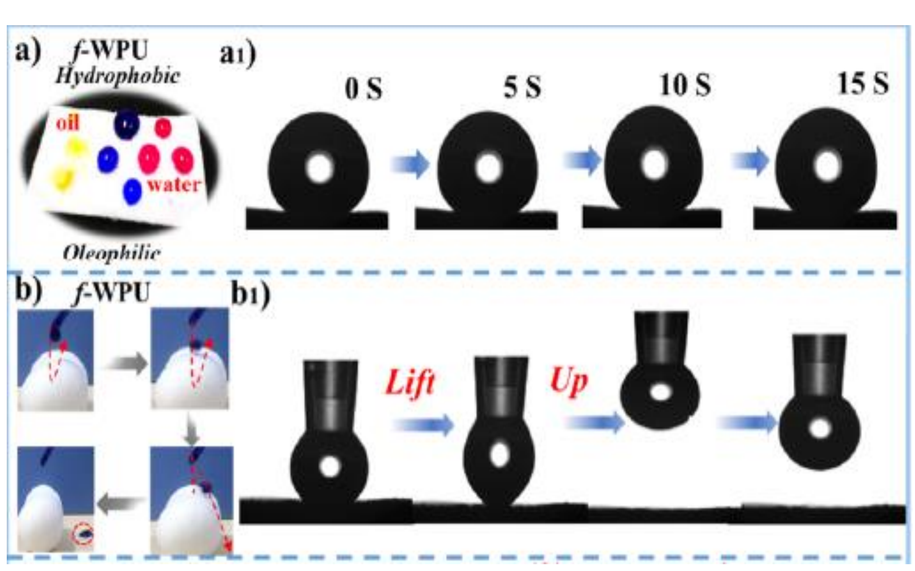




## Results and Discussions





*Super-elastic* *Super-hydrophobic* *Recycled oil absorption*

## Conclusion

In summary, through manipulating nanocellulose hydrophobicity and controlling the crystal nucleation driving force, the multiscale textured topography and the intrinsic bridging-induced topology of WPU aerogels were controllably con-structed for integrated multifunctionality. The resulting ultralight bioinspired WPU aerogels showed the Salvinia-inspired surfaces with multifunctional integration, that is superhydrophobicity, anti-icing, oil/water separation, outstanding thermal insulating comparable to other commercial materials, with excellent compress-recovery under high temperature (80 °C).

## References

Cai, C. Y.; Wei, Z. C.; Fu, Y.; Zhong, W. H., Ultralight Programmable Bioinspired Aerogels with an Integrated Multifunctional Surface for Self-Cleaning, Oil Absorption, and Thermal Insulation via Coassembly. *ACS Applied Materials & Interfaces 2020, 12, 9, 11273-11286*