Supporting Information

Large-scale cauliflower-shaped hierarchical copper nanostructures for efficient photothermal conversion

Peixun Fan,*[ab] Hui Wu,[c] Minlin Zhong,*[a] Hongjun Zhang,[a] Benfeng Bai[b] and Guofan Jin[b]

[a]*Laser Materials Processing Research Centre, School of Materials Science and Engineering, Tsinghua University, Beijing 100084, PR China. Emails: fpx@tsinghua.edu.cn, zhml@tsinghua.edu.cn*

[b]*State Key Laboratory of Precision Measurement Technology and Instruments, Department of Precision Instrument, Tsinghua University, Beijing 100084, PR China*

[c]*State Key Laboratory of New Ceramics and Fine Processing, School of Materials Science and Engineering, Tsinghua University, Beijing 100084, PR China*

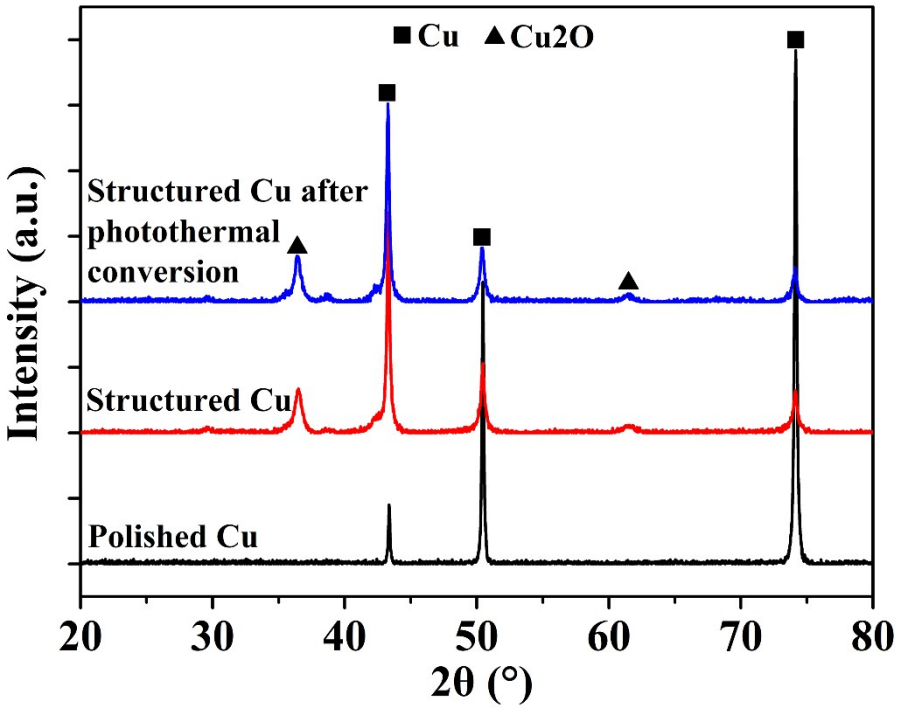

Fig. S1. XRD patterns of the polished Cu surface, the fs laser structured Cu surface (Structure 4), and the fs laser structured Cu surface after photothermal conversion test. As can be seen, the major characteristic peaks in the XRD profile of the structured Cu surface match well with those in the XRD profile of the polished Cu surface. Although recognizable X-ray diffraction peaks representing cuprous oxide can be detected, the intensities of these peaks remain at a low level compared to those representing copper. Thus, it is indicated that the broadband omnidirectional light absorption property is mainly a structural effect rather than induced by chemical change. After photothermal conversion testing in water for 20 minutes under solar irradiation, no obvious change on the chemical composition on the fs laser structured Cu surface can be detected by XRD examination, suggesting that the fs laser structured Cu surface can maintain its chemical stability during photothermal conversion. This guarantees the cyclic utilization of the broadband omnidirectional light absorption Cu surface structures.

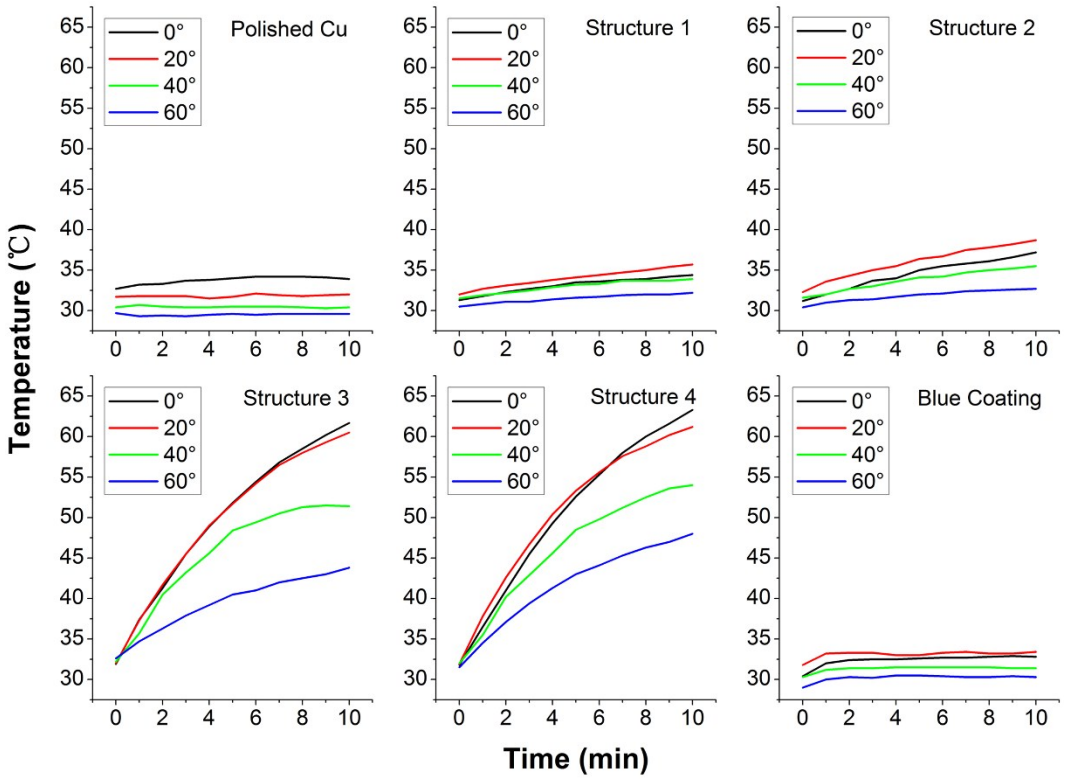

Fig. S2. Temperature change on Cu surfaces with fs laser fabricated micro-nano structures and that with blue coating under varied solar irradiation angles.

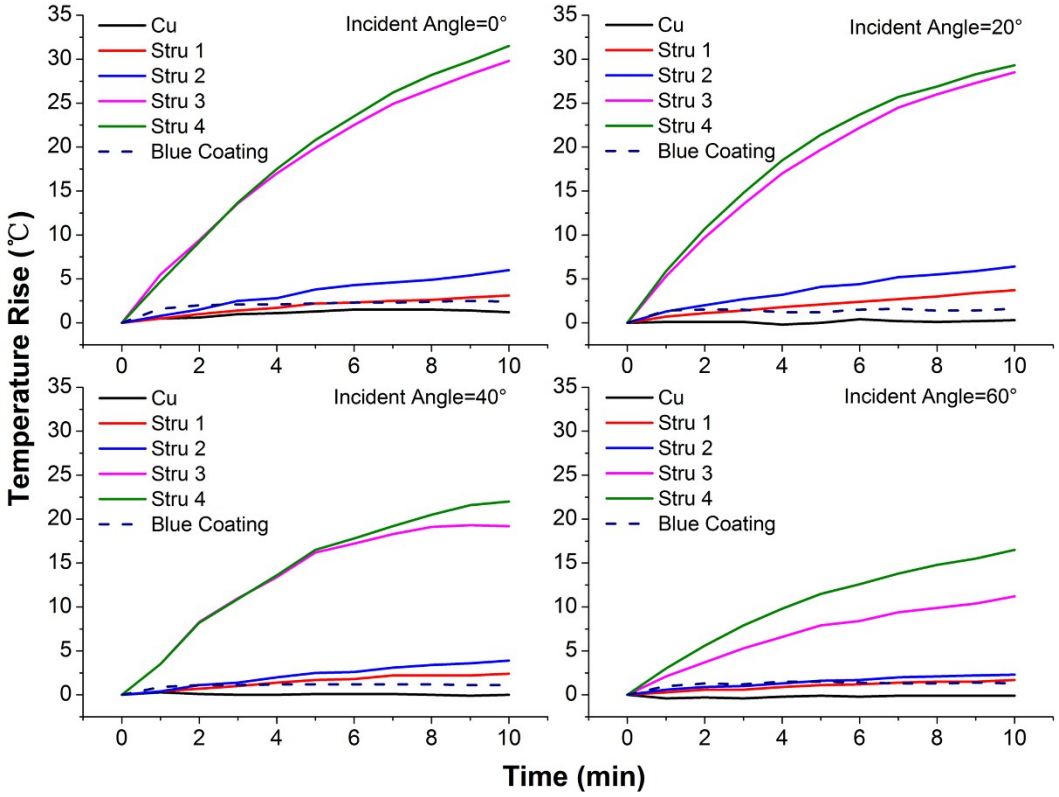

Fig. S3. Temperature rise on Cu surfaces with fs laser fabricated micro-nano structures and that with blue coating under varied solar irradiation angles.

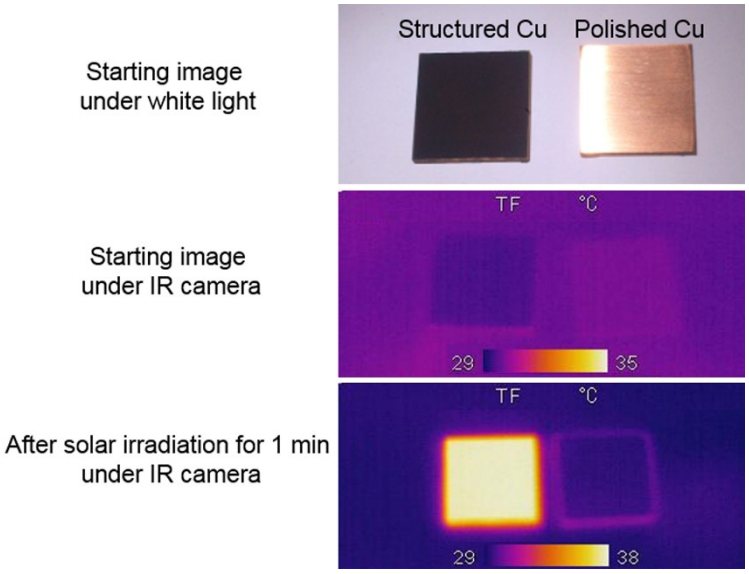

Fig. S4. Comparison of the white light and IR images of the structured Cu surface (Structure 4) with the polished Cu surface.

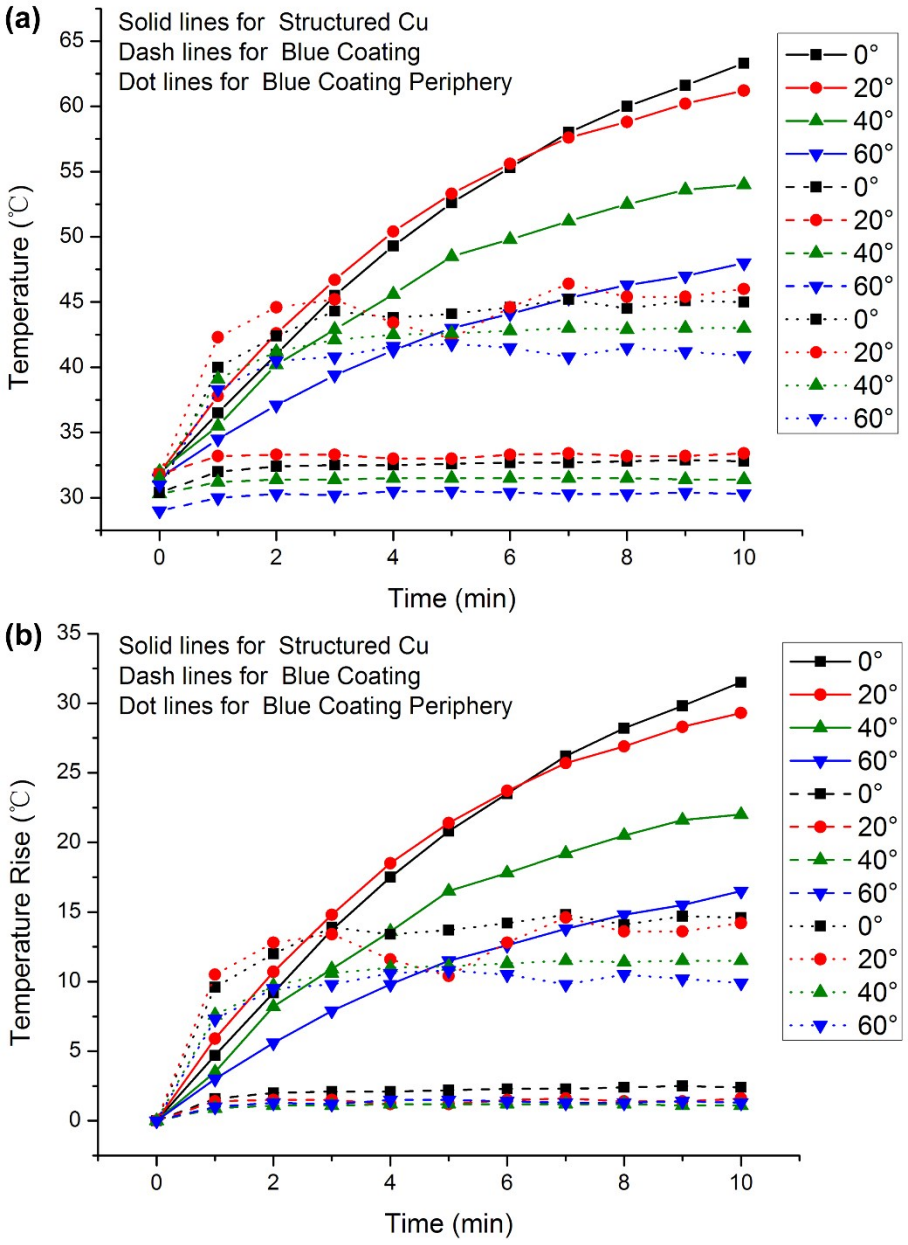

Fig. S5. Comparison of the temperature rise on Cu surface with fs laser fabricated Structure 4 and that with blue coating.

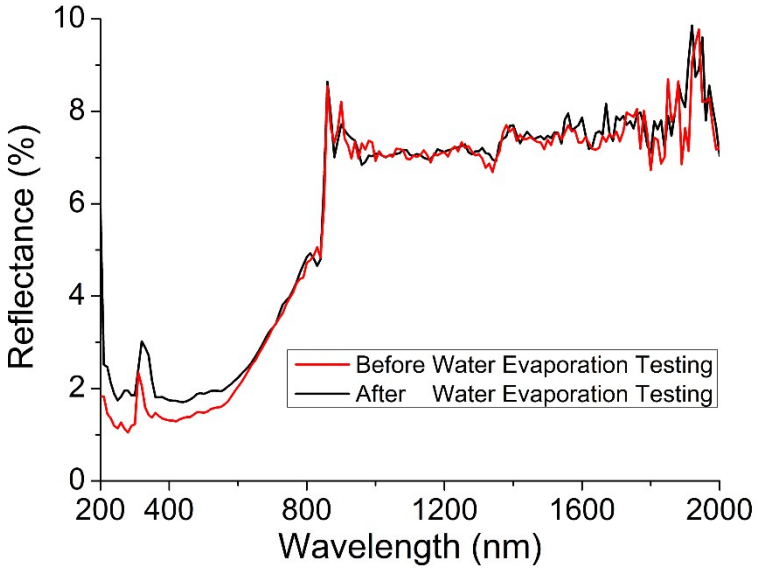

Fig. S6. Reflection spectra for cauliflower-shaped hierarchical copper nanostructures before and after water evaporation testing.