Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A. This journal is © The Royal Society of Chemistry 20XX

Supporting Information

Dual-functional reduced graphene oxide decorated nanoporous polytetrafluoroethylene metafabrics for radiative cooling and solar-heating

Zhuo Luo[a,b], Bai-Xue Li[a], Hao Sun[a], Ji Liu[c], Hao-Yu Zhao[b], Zhong-Zhen Yu[b*], Dongzhi Yang[a*]

[a] State Key Laboratory of Organic-Inorganic Composites, College of Materials Science and Engineering, Beijing University of Chemical Technology, Beijing 100029, China

[b] Beijing Key Laboratory of Advanced Functional Polymer Composites, Beijing University of Chemical Technology, Beijing 100029, China

[c] School of Chemistry, CRANN and AMBER, Trinity College Dublin, Dublin 999015, Ireland

[*]E-mails: yuzz@mail.buct.edu.cn (Z.-Z. Yu); yangdz@mail.buct.edu.cn (D. Yang)

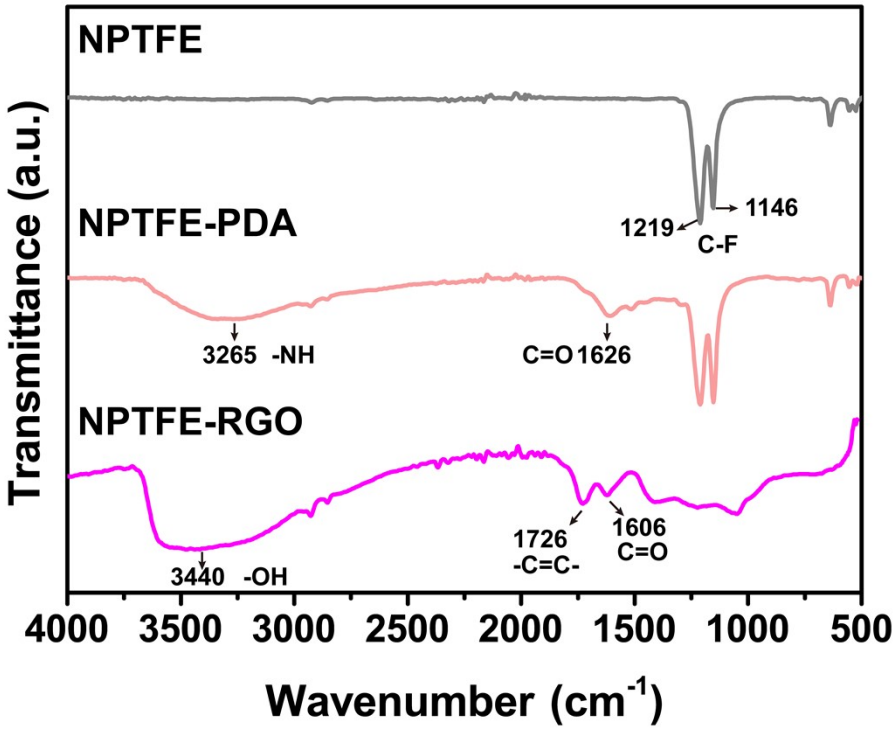

Figure S1. FTIR spectra of NPTFE, NPTFE-PDA, and NPTFE-RGO.

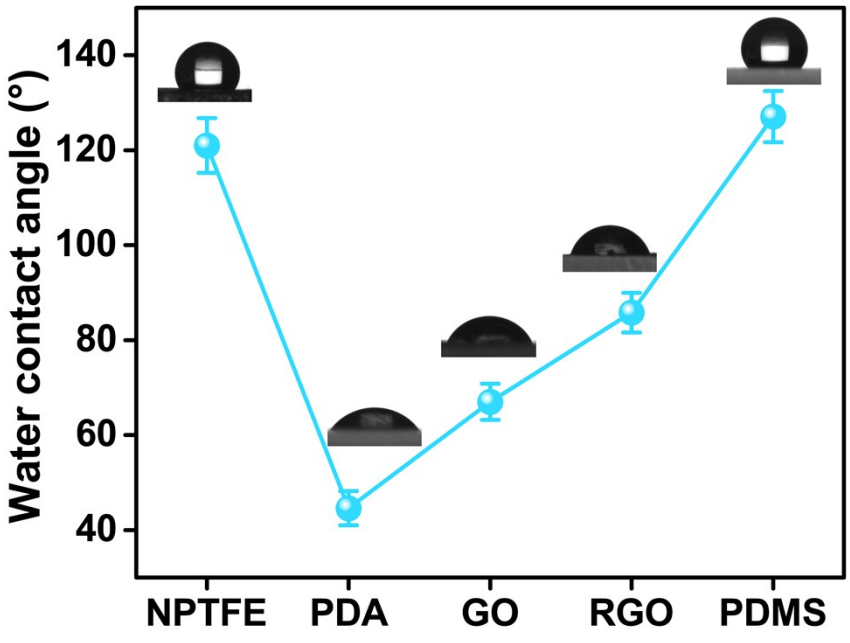

Figure S2. Water contact angles of different layers of the samples.

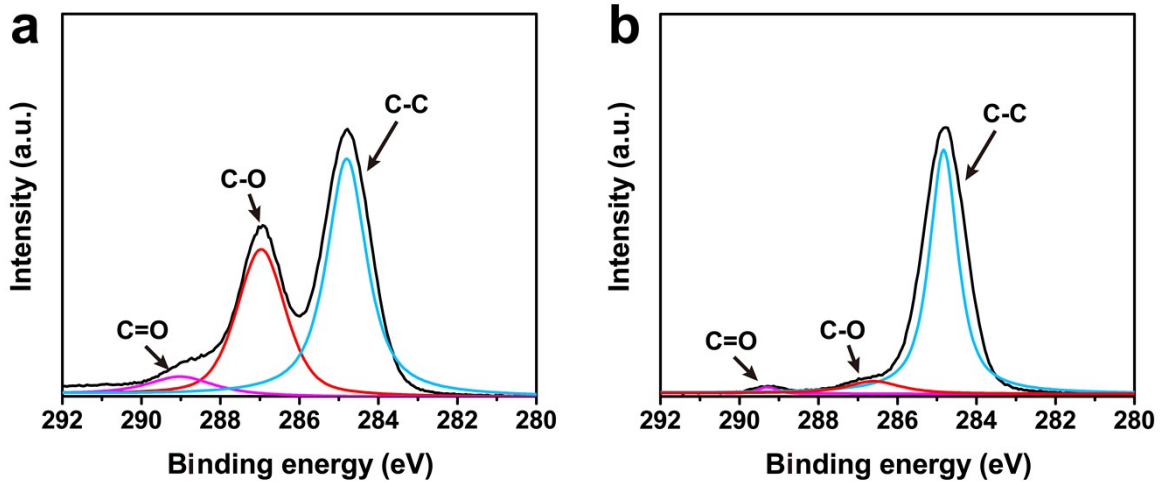

Figure S3. C 1s XPS spectra of the GO layer of the metafabric (a) before and (b) after thermal treatment at 80 °C.

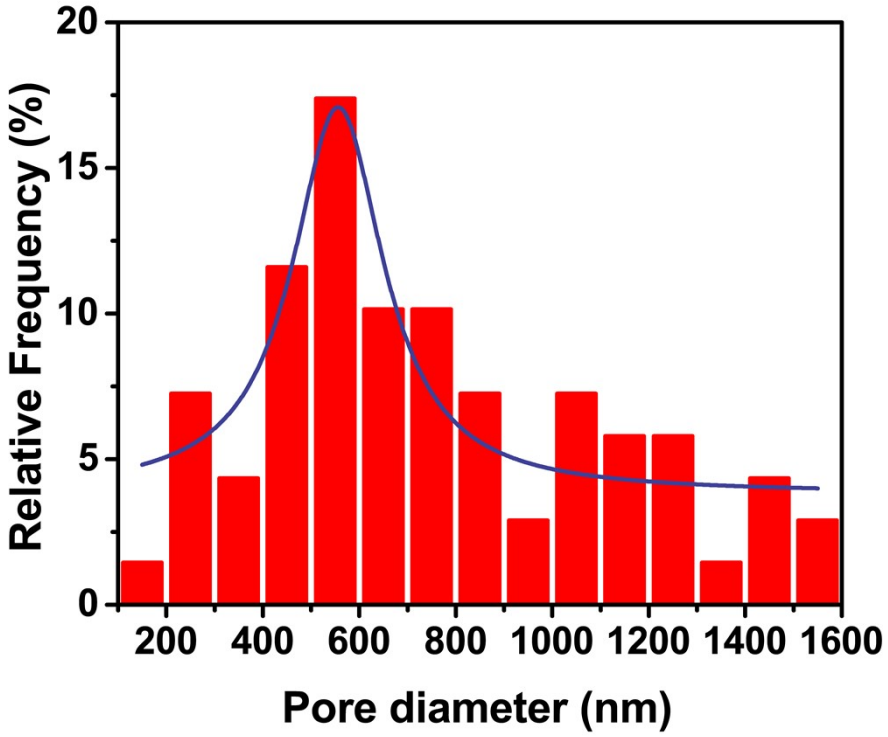

Figure S4. Pore size distribution of NPTFE.

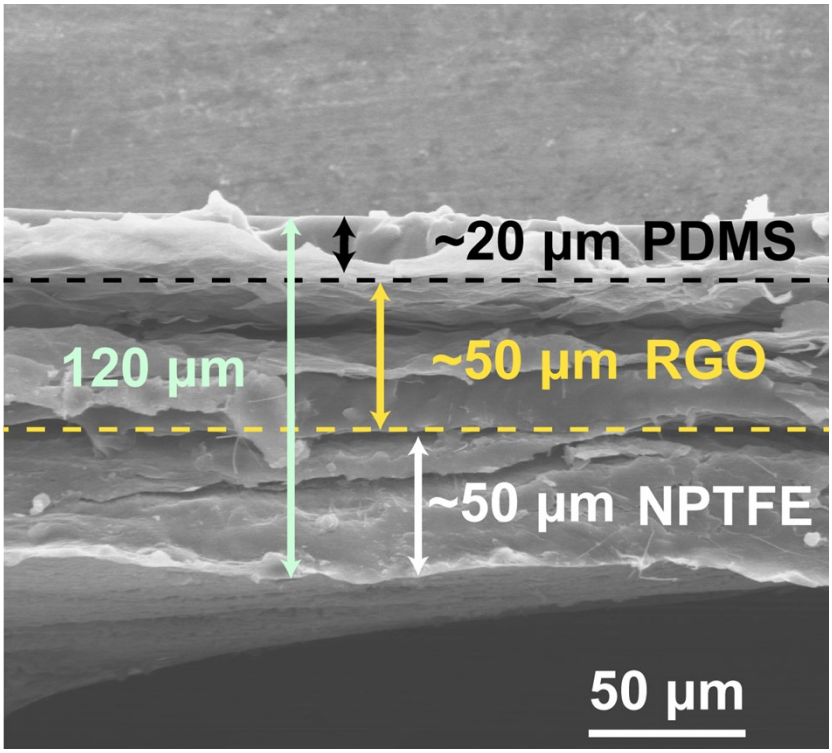

Figure S5. Cross-sectional SEM image of the metafabric.

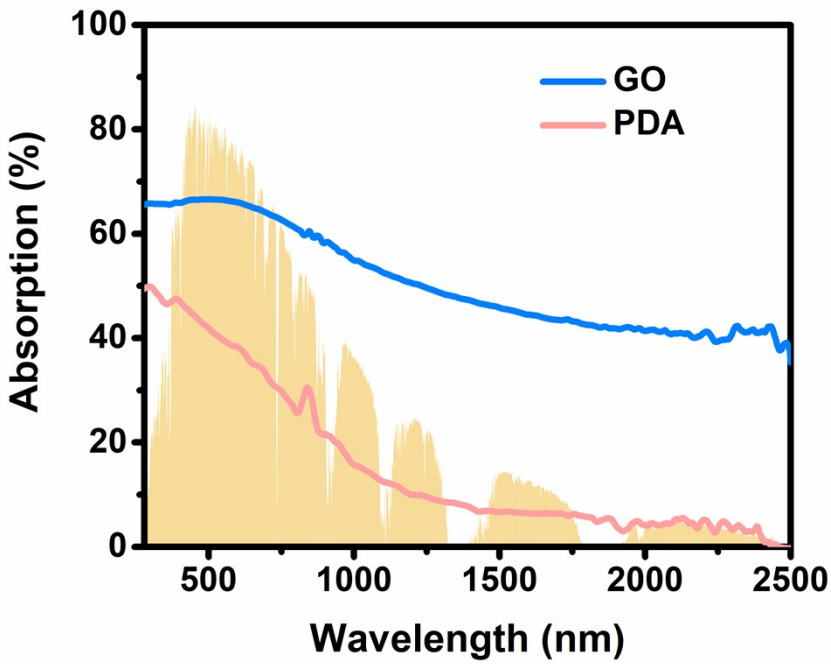

Figure S6. Absorptions of NPTFE-GO layer, and NPTFE-PDA layer in AM 1.5 G solar spectrum.

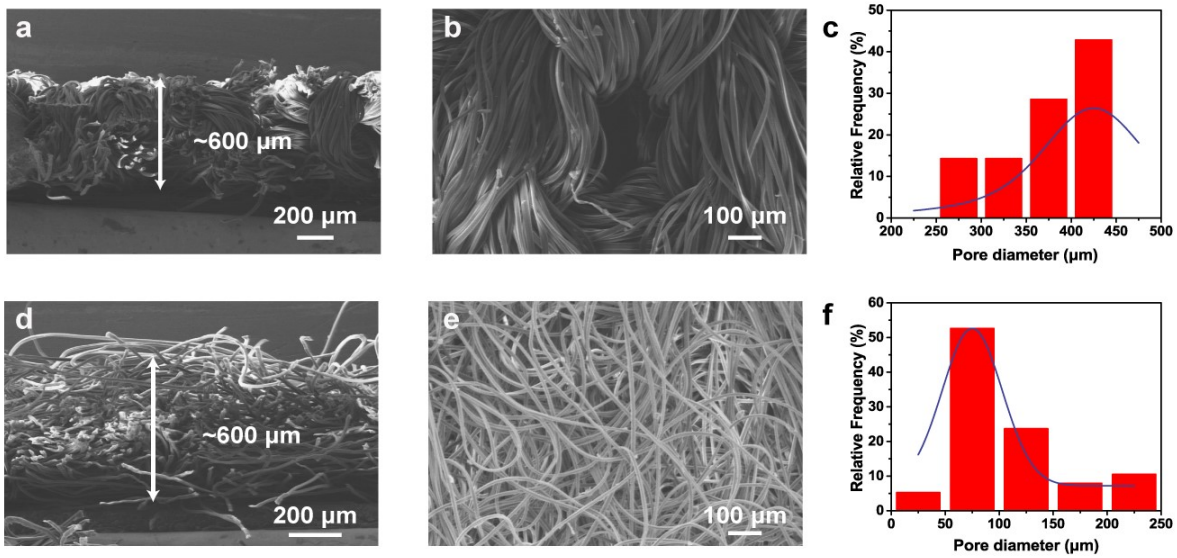

Figure S7. SEM images and pore size distributions of (a-c) Coolmax, and (d-f) cotton textile.

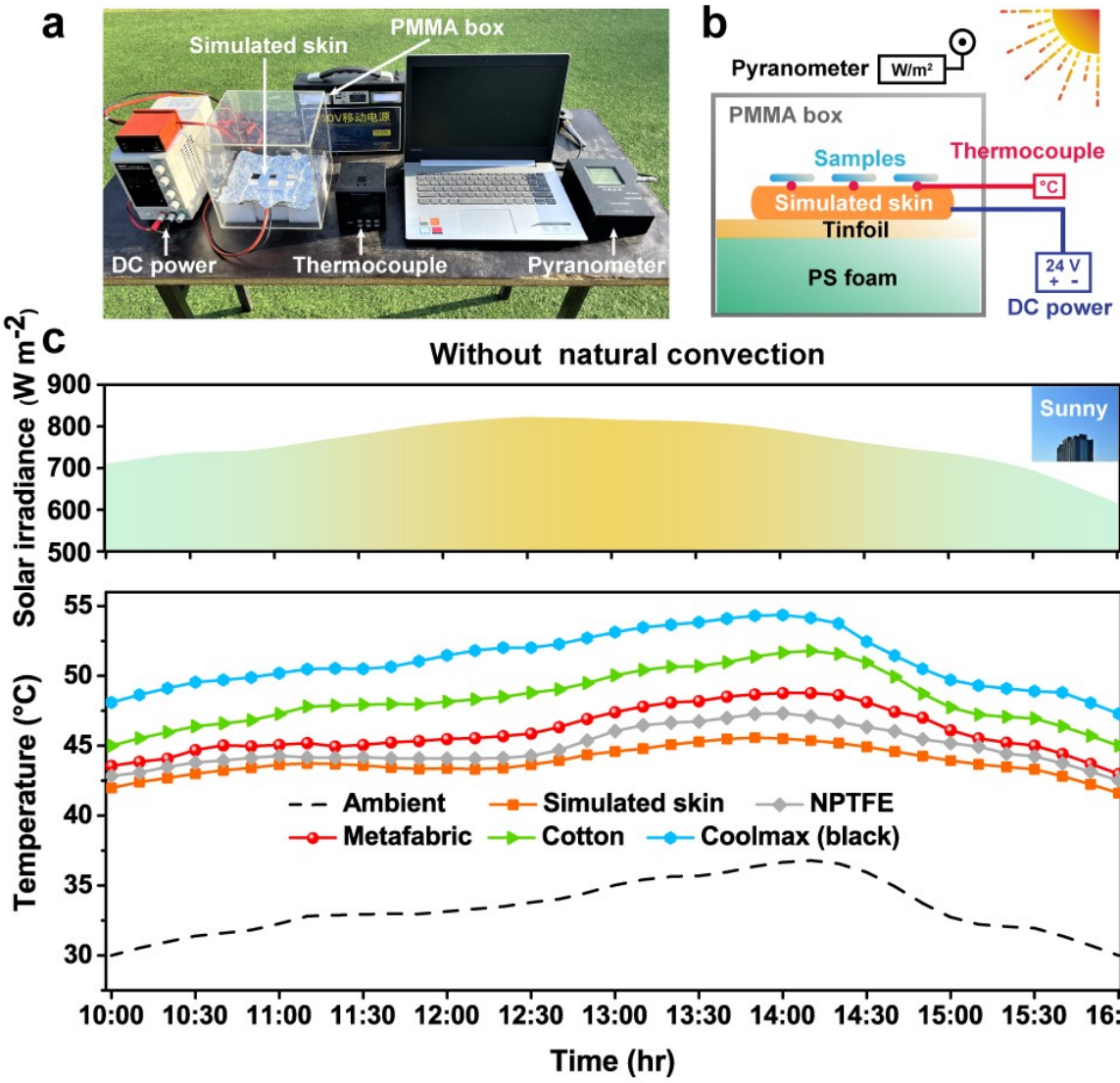

Figure S8. (a) Photograph and (b) schematic showing the experimental device used to measure continuous outdoor cooling performances without natural convection. (c) Real-time temperatures of the simulated skin covered by different textiles during outdoor radiative cooling without natural convection in Beijing on September 24, 2022.

Note that the temperature difference between the NPTFE and metafabric covered skins and the skin covered with control samples (cotton, and bare simulated skin) at outdoor scenarios is not large as they are in indoor situations, which is attributed to that the surface temperature of the cotton-covering skin and the bare simulated skin can be affected not only by the radiation but also the strong convection. The cotton with large pores and the bare skin directly exposed

in the air can carry away more heat via natural convection (**Figure S7**).

To minimize the effects of disturbing factor of air convection, the above device is put in a transparent PMMA box to investigate the daytime radiative cooling performances (**Figure S8**). In the absence of the air convection, the air temperature in the PMMA box can rise to more than 30 °C due to the heat accumulation by the radiation from the sunlight and the skin. With the continuous radiating of the sunlight, the ambient temperature peak becomes 36.8 °C at 14:10, and the surface temperature of the bare simulated skin rises to 45.4 °C at the same time. Meanwhile, the NPTFE (47.1 °C) and metafabric (48.7 °C) covered skin exhibit mild rises than the bare skin, and show significant temperature drops of 4.8 and 3.2 °C as compared to the cotton (51.9 °C), respectively, demonstrating the radiative cooling performance of the metafabric, which is consistent with the results in indoor environment.

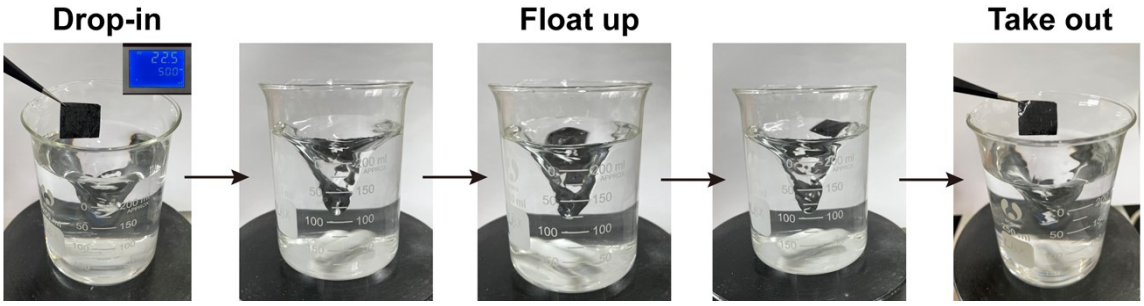

Figure S9. Washing of the metafabric with a rotating speed of 500 rpm.

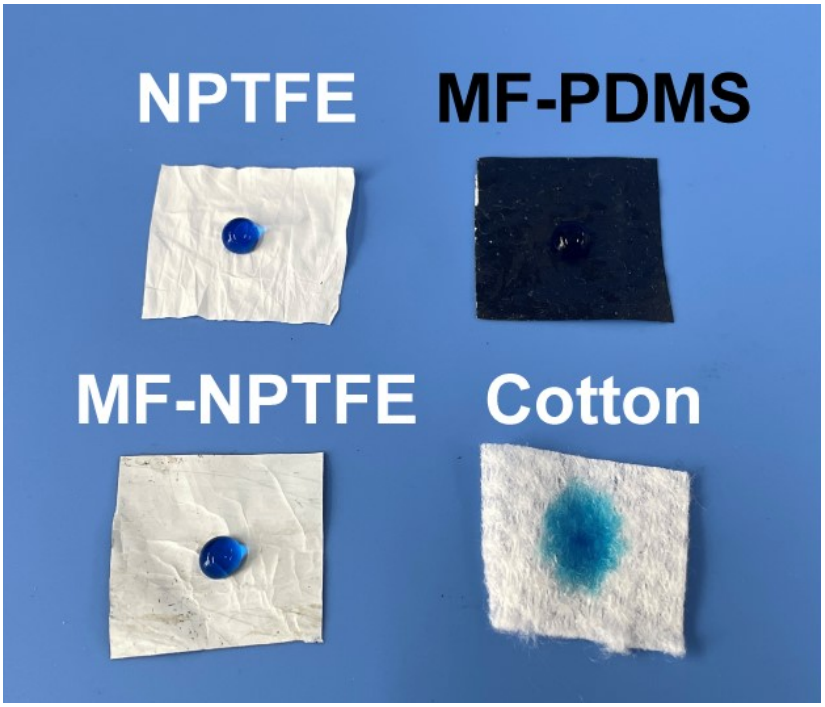

Figure S10. Vegetable oil repellence on different layers of the metafabric.