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Supporting Information

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Dual-Mode Integrated Janus Films with Highly Efficient NaH_2PO_2-Enhanced Infrared Radiative Cooling and Solar Heating for Year-Round Thermal Management

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Dual-mode integrated Janus films with highly efficient NaH_2PO_2-enhanced infrared radiative cooling and solar heating for year-round thermal management

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Table.S1 Comparison of the average solar reflectance $\bar{R}_{solar}$, average infrared emittance $\bar{\varepsilon}_{IR}$ and sub-ambient cooling temperatures of cooling side with other previously reported porous films.

Samples	$\bar{R}_{solar}$	$\bar{\varepsilon}_{IR}$	Cooling temperature	Reference
PMMA/NaH_2PO_2 porous film	92.6%	97.2%	8.8 °C	This work
3DPCA/SiO_2 film	96%	95%	8.6 °C	[1]
PVDF/PDMS porous film	97%	96%	12.3 °C	[2]
EPDM/SiO_2 porous film	96%	95%	12 °C	[3]
Nanoporous $MgHPO_4 \cdot 1.2H_2O$ powder	92%	94%	4.1 °C	[4]
3DPCA/TiO_2 film	97%	96%	10 °C	[5]
Hierarchical pores P(VdF-HFP) film	96%	96%	7 °C	[6]
3D PCA/h-$AlPO_4$ nano-laminated film	97%	96.6%	13 °C	[7]
SiO_2@PDMS film	85%	95%	2 °C	[8]

Table.S2 Comparison of the average solar absorbance $\bar{\alpha}_{solar}$ and heating temperatures of heating side with other previously reported photothermal material.

Samples	$\bar{\alpha}_{solar}$	Temperature under 1 Sun	Heating temperature	Reference
PPy modified cotton	98.0%	88 °C	49.5、45.5	This work
CNT@PDMS film	95%	36 °C	7 °C	[8]
PPy@PVDF-HFP	96.9%	60 °C	35.8	[9]
CNT embedded PAN nonwoven fabrics	90.8%	43 °C	23.7 °C	[10]
Ag NPs encapsulated in amorphous carbon	92.3%	94 °C	/	[11]
$Ti_3C_2T_x$ MXene Decorated nanoPE Textile	91.3%	/	43.7 °C	[12]
3D structured graphene metamaterial	95.0%	52 °C	/	[13]

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Table.S3 The thermal conductivities of cotton and cooling/heating side of Janus film.

Sample	Heating side	Cooling side	Cotton
Thermal conductivity (W/ mK)	0.234	0.089	0.112

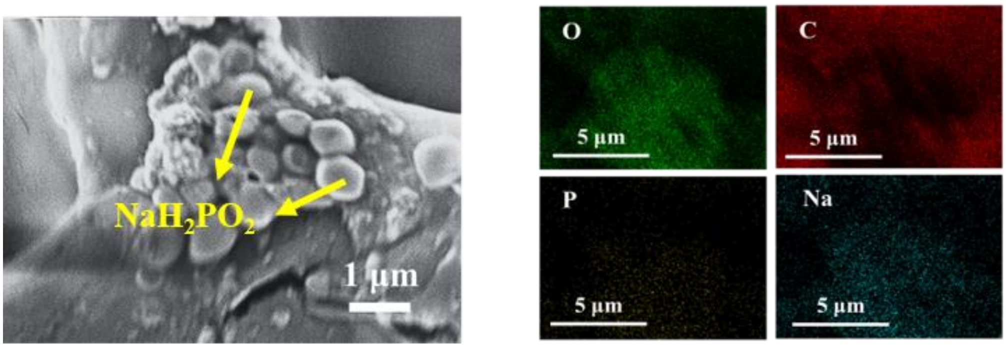

Figure S1. SEM images and EDS elemental mappings of individual NaH_2PO_2 particles**.**

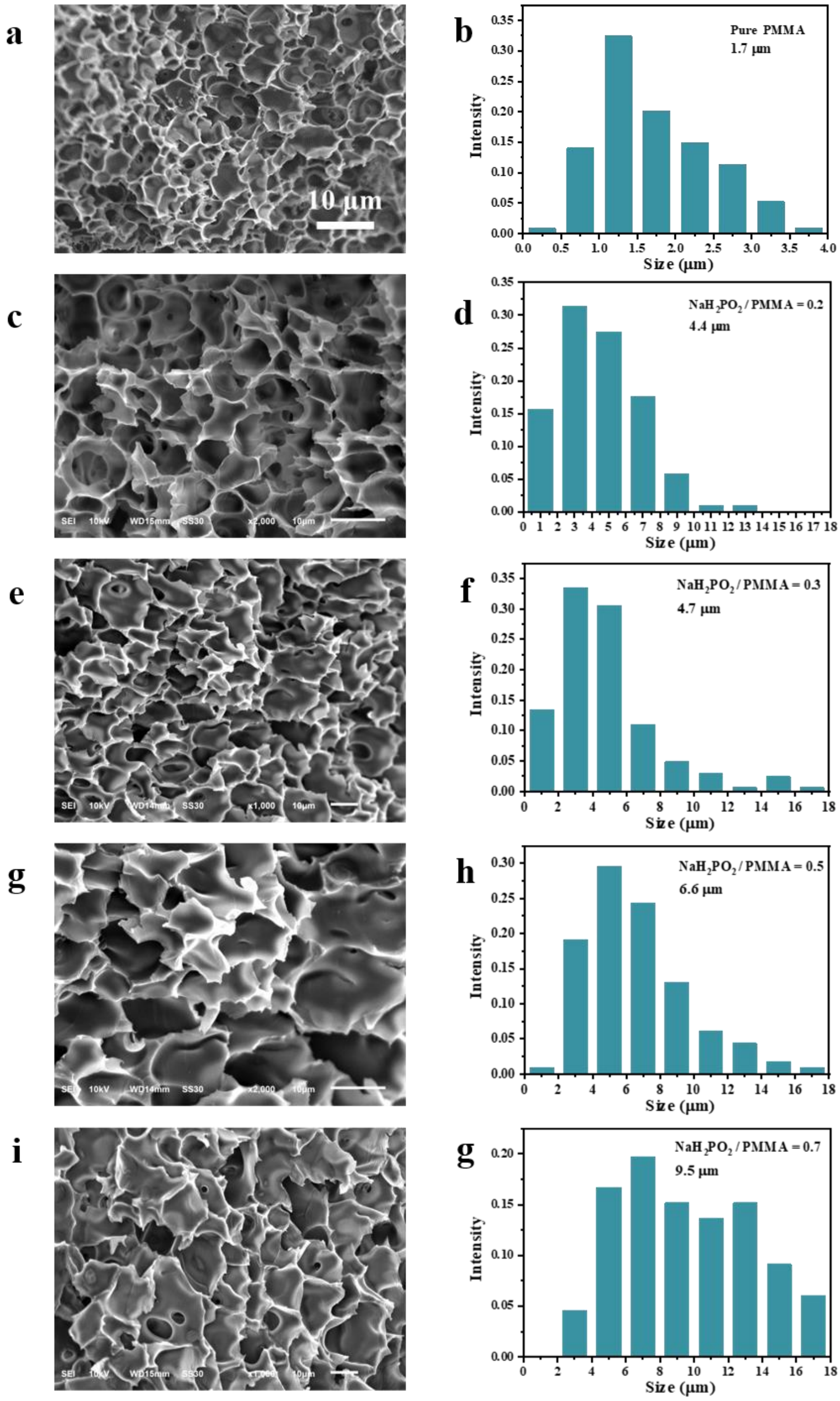

Figure S2. SEM images of cross section and micropore size distribution for (a-b) Pure PMMA, (c-d) PMMA/NaH_2PO_2-0.2, (e-f) PMMA/NaH_2PO_2-0.3, (g-h) PMMA/NaH_2PO_2-0.5 and (i-j) PMMA/NaH_2PO_2-0.7.

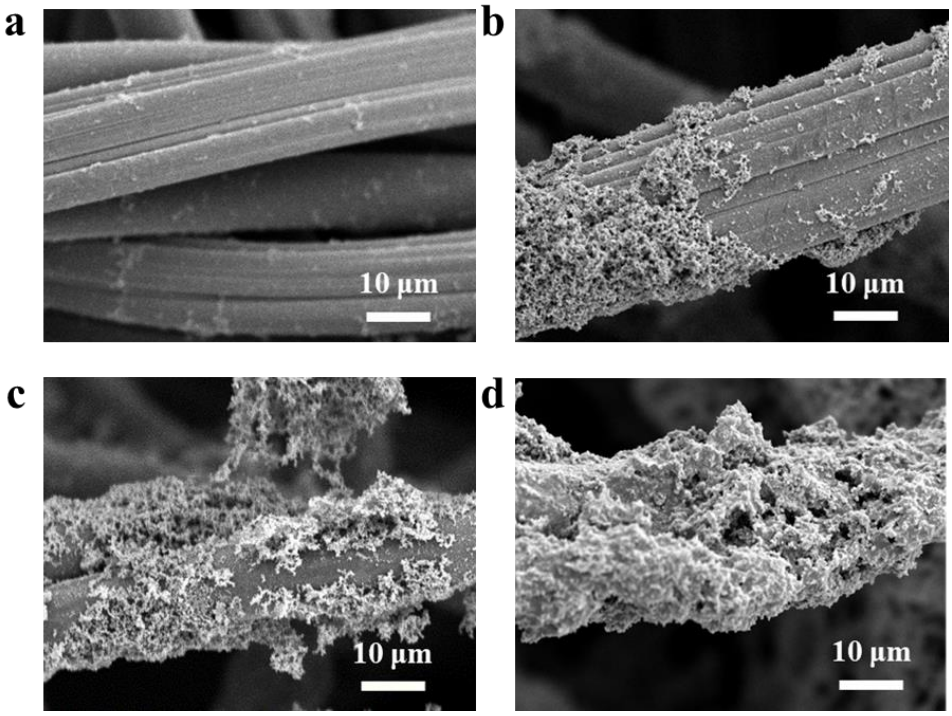

Figure S3. SEM images of PMC with different Fe^{3+} concentrations. (a) PMC-0.5 M, (b) PMC-1 M, (c) PMC-2 M, (d) PMC-4 M.

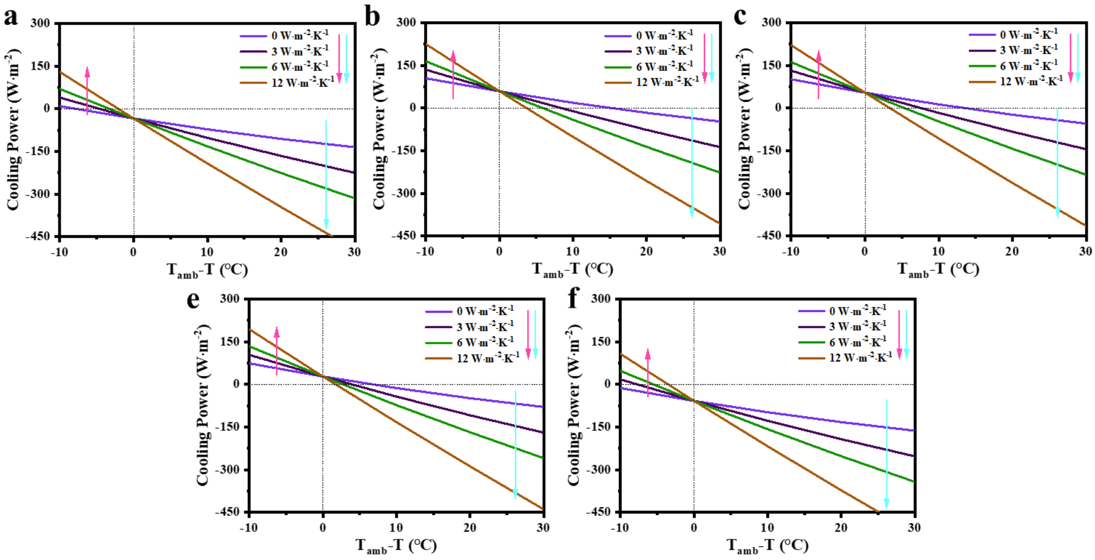

Figure S4. Calculated net cooling power of (a) PMMA, (b) PMMA/NaH_2PO_2-0.2, (c) PMMA/NaH_2PO_2-0.3, (d) PMMA/NaH_2PO_2-0.5 and (e) PMMA/NaH_2PO_2-0.7 during the daytime. The variable h_c is a combined nonradiative heat coefficient. Values of 0, 3, 6, 9, and 12 for h_c are used in the calculations.

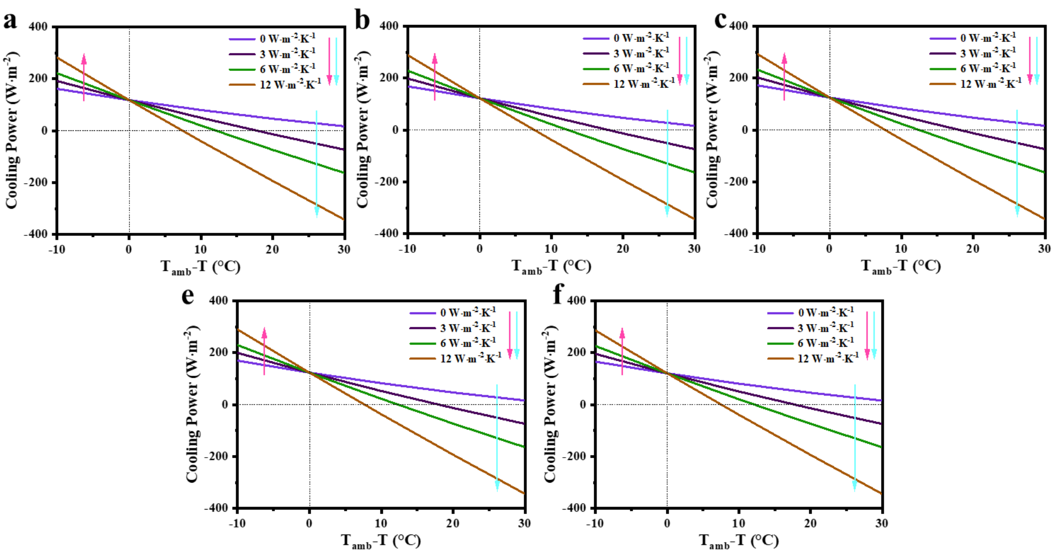

Figure S5. Calculated net cooling power of (a) PMMA, (b) PMMA/NaH_2PO_2-0.2, (c) PMMA/NaH_2PO_2-0.3, (d) PMMA/NaH_2PO_2-0.5 and (e) PMMA/NaH_2PO_2-0.7 during the nighttime. The variable h_c is a combined nonradiative heat coefficient. Values of 0, 3, 6, 9, and 12 for h_c are used in the calculations.

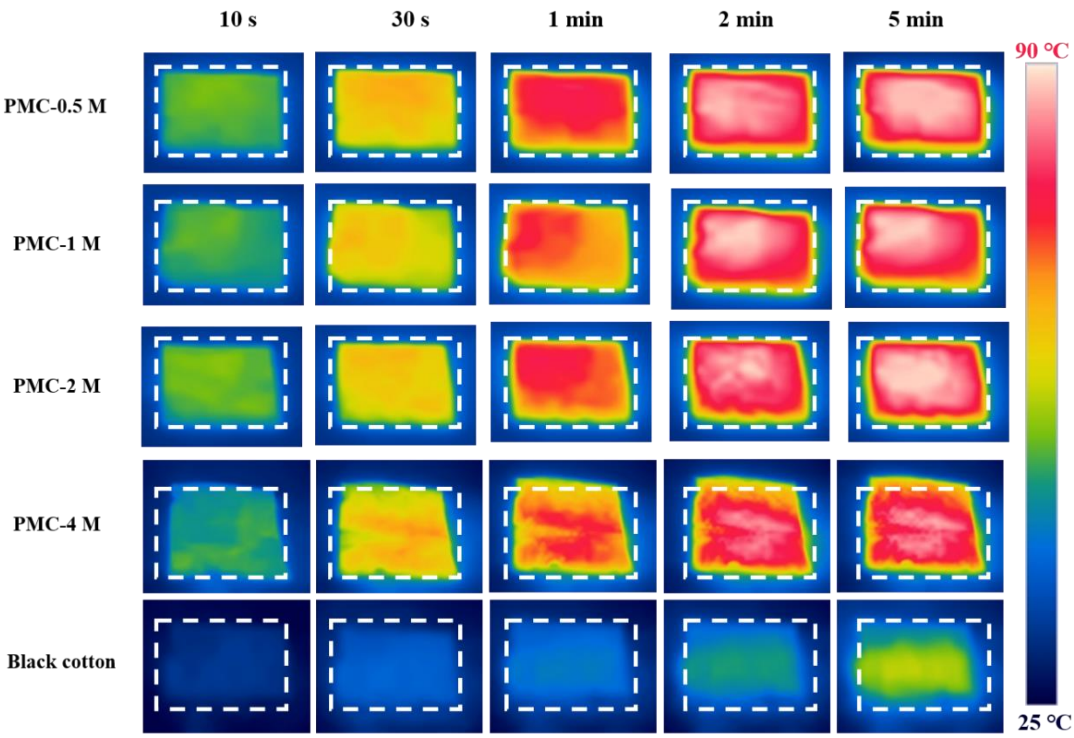

Figure S6. IR images for a series of PMCs and black cotton.

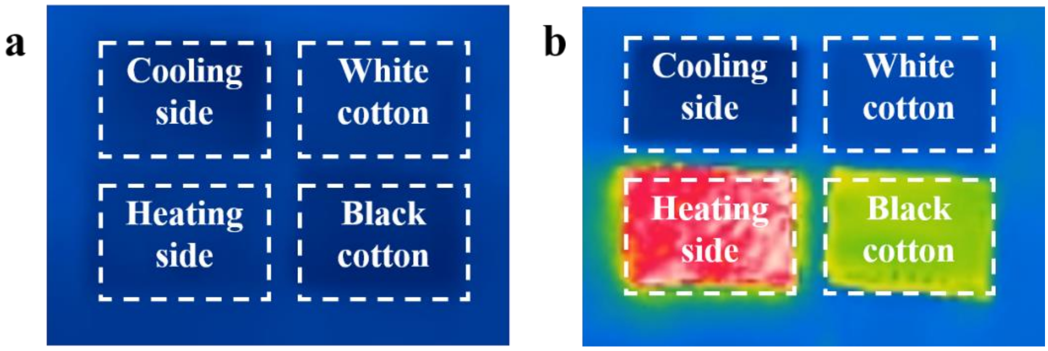

Figure S7. Infrared images of different samples under 100 mW·m^{-2} solar intensity.

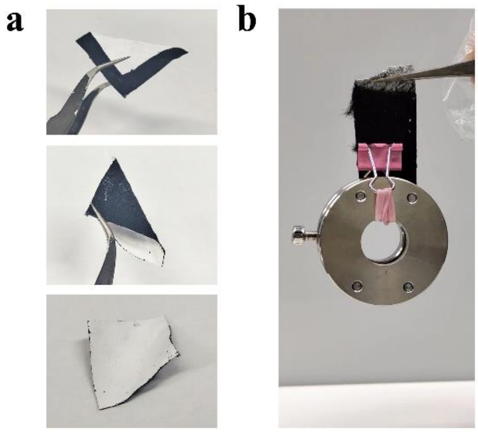

Figure S8. (a) Mechanical deformation and (b) adhesion of the dual-mode Janus film.

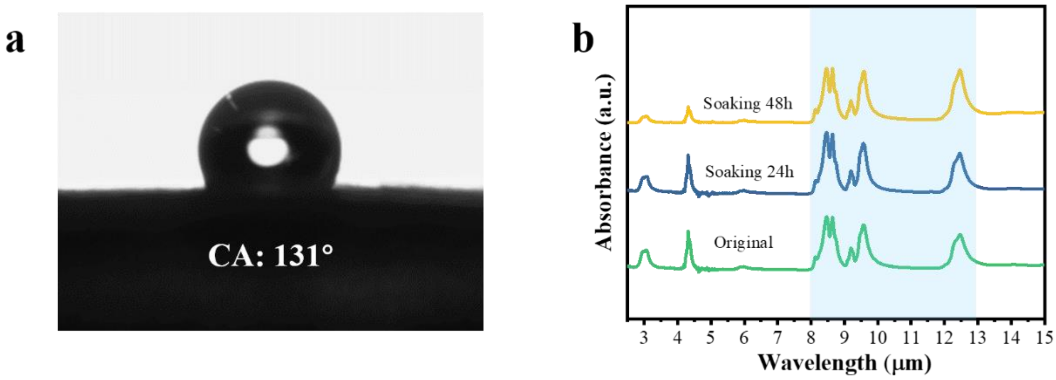

Figure S9. (a) Apparent water contact angles of cooling side. (b) Absorbance spectra of the cooling side after immersion in aqueous solutions.