

Supporting Information

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1. Dataset Details

Table S1. Statistical analysis of features in the dataset

	ratio_num(wt%)	modifier_content(wt%)	SR(%)	MIR(W/m ²)	SOLAR	Air(°C)	T(°C)
Mean	90.82	0.15	0.43	92.17	477.59	32.30	8.72
Std	15.94	0.15	4.54	4.21	220.86	10.44	4.83
Min	55.00	0.00	78.00	80.00	0.00	5.48	0.89
25%	82.00	0.00	89.00	90.00	285.14	24.81	4.56
50%	100.00	0.04	92.00	92.00	477.59	31.61	8.72
75%	100.00	v	95.00	94.00	612.71	41.20	11.74
Max	100.00	0.43	98.00	98.00	912.34	57.36	40.28

The continuous variables (ratio_num, modifier_content, SR, MIR, SOLAR, air, and T) are presented with their statistical values in the table above. For the matrix materials and modifiers, one-hot encoding was used where:

- Matrix materials (CNF, CS, CaSiO₃, MTMS, PAAm, PDMS, PEA, PLA, PPU, PVA, PVDF, SA) are encoded as binary variables (0 or 1)

- Modifiers (1,4-Dioxane, Al₂O₃, AlCl, CaCO₃, LiCl, PDA, PTFE, SiO₂, TiO₂, WA, ZnO, ZrO₂) are encoded as binary variables (0 or 1)

When a specific material or modifier is present in a sample, its corresponding variable is set to 1; otherwise, it is set to 0.

Data S2. Literature Data Sources

The experimental data used in this study were extracted from the following published literature. These papers constitute the primary data sources for our machine learning analysis:

1. Gu, B.; Fan, F.; Xu, Q.; Shou, D.; Zhao, D. A Nano-Structured Bilayer Asymmetric Wettability Textile for Efficient Personal Thermal and Moisture Management in High-Temperature Environments. *Chemical Engineering Journal* **2023**, *461*, 141919, doi:10.1016/j.cej.2023.141919.
2. Shan, X.; Liu, L.; Wu, Y.; Yuan, D.; Wang, J.; Zhang, C.; Wang, J. Aerogel-Functionalized Thermoplastic Polyurethane as Waterproof, Breathable Freestanding Films and Coatings for Passive Daytime Radiative Cooling. *Advanced Science* **2022**, *9*, 2201190, doi:10.1002/advs.202201190.
3. Li, T.; Sun, H.; Yang, M.; Zhang, C.; Lv, S.; Li, B.; Chen, L.; Sun, D. All-Ceramic, Compressible and Scalable Nanofibrous Aerogels for Subambient Daytime Radiative Cooling. *Chemical Engineering Journal* **2023**, *452*, 139518, doi:10.1016/j.cej.2022.139518.
4. Cai, W.; Lin, B.; Qi, L.; Cui, T.; Li, Z.; Wang, J.; Li, S.; Cao, C.; Ziaur Rahman, M.; Hu, X.; et al. Bio-Based and Fireproof Radiative Cooling Aerogel Film: Achieving Higher Sustainability and Safety. *Chemical Engineering Journal* **2024**, *488*, 150784, doi:10.1016/j.cej.2024.150784.
5. Cai, C.; Chen, W.; Wei, Z.; Ding, C.; Sun, B.; Gerhard, C.; Fu, Y.; Zhang, K. Bioinspired “Aerogel Grating” with Metasurfaces for Durable Daytime Radiative Cooling for Year-Round Energy Savings. *Nano Energy* **2023**, *114*, 108625, doi:10.1016/j.nanoen.2023.108625.
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Season-Adaptive Radiative Thermal Regulation. *Small* **2023**, *19*, 2302509, doi:10.1002/sml.202302509.

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9. Zhong, S.; Yuan, S.; Zhang, X.; Zhang, J.; Xu, L.; Xu, T.; Zuo, T.; Cai, Y.; Yi, L. Hierarchical Cellulose Aerogel Reinforced with In Situ-Assembled Cellulose Nanofibers for Building Cooling. *ACS Appl. Mater. Interfaces* **2023**, *15*, 39807 – 39817, doi:10.1021/acsami.3c06178.

10. Lan, P.-H.; Hwang, C.-W.; Chen, T.-C.; Wang, T.-W.; Chen, H.-L.; Wan, D. Hierarchical Ceramic Nanofibrous Aerogels for Universal Passive Radiative Cooling. *Advanced Functional Materials* **2024**, *34*, 2410285, doi:10.1002/adfm.202410285.

11. Liu, X.; Zhang, M.; Hou, Y.; Pan, Y.; Liu, C.; Shen, C. Hierarchically Superhydrophobic Stereo-Complex Poly (Lactic Acid) Aerogel for Daytime Radiative Cooling. *Advanced Functional Materials* **2022**, *32*, 2207414, doi:10.1002/adfm.202207414.

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15. Yu, Y.; Wei, L.; Pang, Z.; Wu, J.; Dong, Y.; Pan, X.; Hu, J.; Qu, J.; Li, J.; Tian, D.; et al. Multifunctional Wood Composite Aerogel with Integrated Radiant Cooling and Fog – Water Harvesting for All-Day Building Energy Conservation. *Advanced Functional Materials* *n/a*, 2414590, doi:10.1002/adfm.202414590.

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20. Cai, W.; Li, Z.; Xie, H.; Wang, W.; Cui, T.; Lin, B.; Qi, L.; Hu, X.; Du, Y.; Ming, Y.; et al. Thermally Managed and Fireproof Composite Aerogels for Safer and Year-Round Energy Saving. *Chemical Engineering Journal* **2024**, 483, 149006, doi:10.1016/j.cej.2024.149006.

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