

Cooling power can be improved by overlaying metamaterials

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During the solar radiation peaks, Fig.4C in Zhai's paper (1) shows that cooling power dramatically decreases. It is because the volume of the hybrid metamaterial is not sufficient. In order to improve the cooling power of Zhai's film, near-perfect reflection should be achieved. Fig.S2A in Zhai's supplementary material indicates that the maximum refractive index is about 22 degree ($\arctan(80\text{cm}/2/100\text{cm})=21.8$).

Because of $90/21.8=4.1$, overlaying five films should make less likely to become hot. Because of $22-(22*5-90)=2$, the near-perfect reflection can be achieved. In other words, cooling power can be improved by overlaying the hybrid metamaterial films.

References:

1. Yao Zhai, et al., Scalable-manufactured randomized glass-polymer hybrid metamaterial for daytime radiative cooling, Science 355, 1062–1066 (2017)