Radiative Cooling Paint

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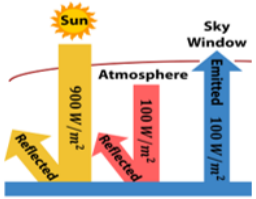
OBJECTIVES

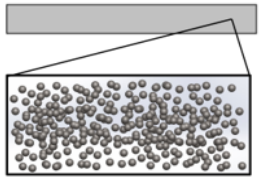
- Manufacture inexpensive, easily scalable, single layer dielectric nanoparticle coating
- Achieve passive cooling over a 24-hr period
- An experimentally validated simulation tool to model radiative properties of the nanoparticle radiative coating.

METHODOLOGY

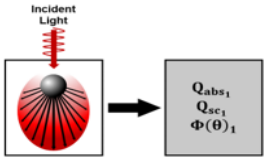
(A) Schematic of passive radiative cooling



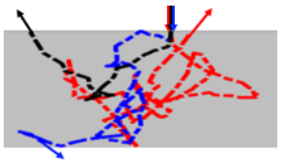
(B) Coating Structure



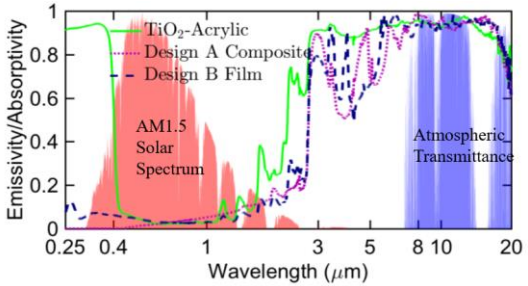
(C) Mie Theory for Effective Medium

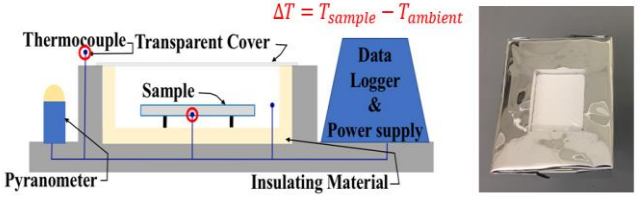


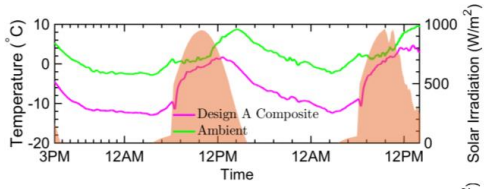
(D) Monte Carlo on Effective Medium

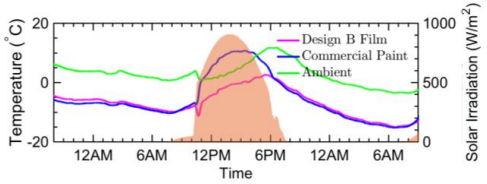


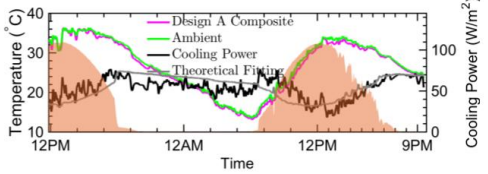
EXPERIMENTAL RESULTS

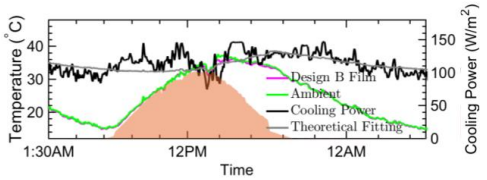




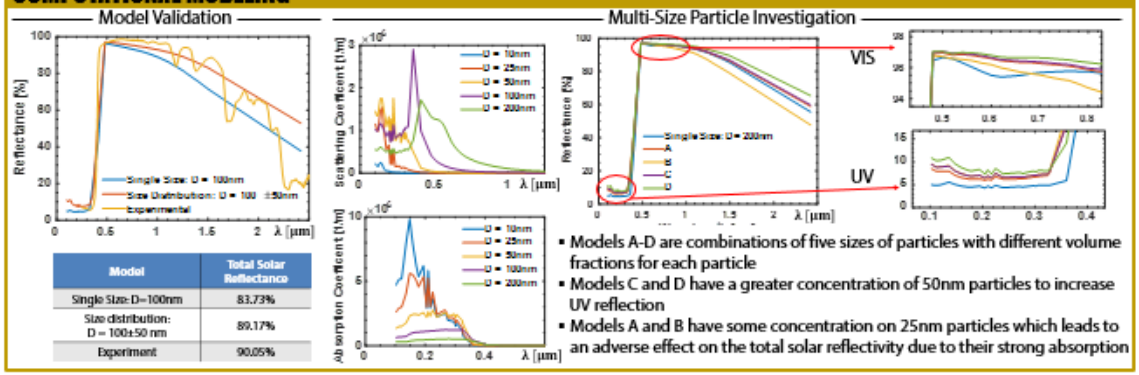








COMPUTATIONAL MODELING



Model	Total Solar Reflectance
Single Size: D=100nm	83.73%
Size distribution: D = 100±50 nm	89.17%
Experiment	90.05%

- Models A-D are combinations of five sizes of particles with different volume fractions for each particle
- Models C and D have a greater concentration of 50nm particles to increase UV reflection
- Models A and B have some concentration on 25nm particles which leads to an adverse effect on the total solar reflectivity due to their strong absorption

REFERENCES

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