

Radiative Cooling Paint

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Objective

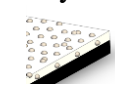
- Develop high-performance, low-cost, metal-free and scalable nanoparticle-based cooling paint to achieve radiative cooling during nighttime and daytime.
- An experimentally validated simulation tool to model radiative properties of the nanoparticle radiative coating.

Theoretical Modeling

Mie theory

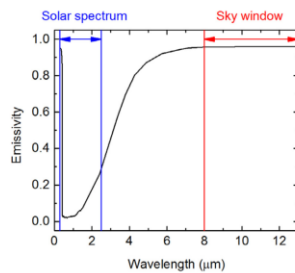
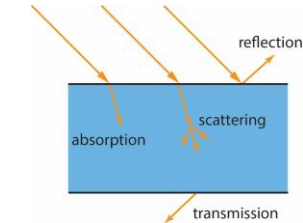


TiO₂ - Acrylic



Carbon Black

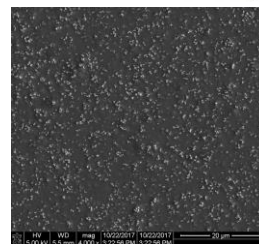
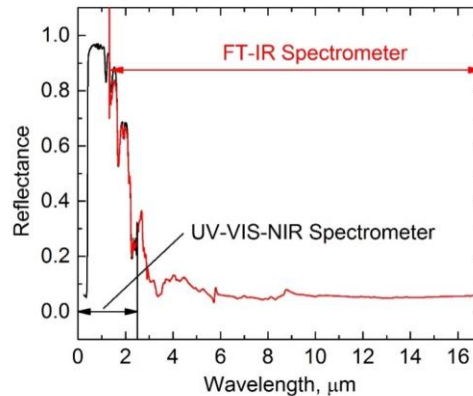
Radiative transfer equation (RTE)
Monte Carlo simulations



Fabrication



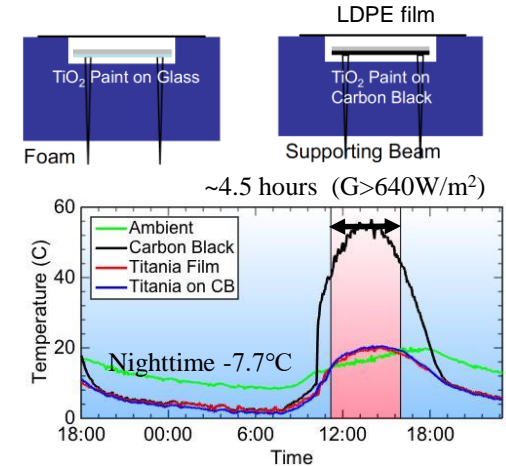
Characterization



SEM images of particle dispersion

Spectral characterization with FT-IR spectrometer

Onsite Cooling Characterization



- TiO₂ Paint achieves partial daytime cooling.
- Heating is greatly reduced even at the peak of the solar irradiation.

Impact

- Industrial compatible paint is fabricated and tested for daytime cooling effect.
- Particle daytime cooling is observed with TiO₂ paint.

Reference

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- Zhai, Y., et al. (2017). *Science*, 7899(February), 1–9.
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- Raman, et al (2014). *Nature*, 515(7528), 540–4.
- Gentle, et al(2010). *Nano Letters*, 10(2), 373–379.

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