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Silicone Rubber Coating for Radiative Cooling Applications

A durable, thermoset silicone coating with high solar reflectance and IR emittance suited for roofs, offshore, and harsh outdoor gear.

Researchers at Purdue University have developed a silicone rubber coating for radiative cooling applications. Radiative cooling is a nascently developing field seeking to attenuate global warming by reducing heat island effects and lowering cooling costs. In the silicone coating industry, it is common for regular paints such as acrylics to be used. However, they contain thermoplastic materials apt to reshape and become damaged when exposed to chemical solvents, which is acute for coatings on outdoor or offshore industrial chemical production or oil and gas equipment. Existing solutions to this problem have adopted TiO2-based silicone coatings, but the TiO2 compound has the propensity to absorb near-infrared and UV radiation, ultimately hindering the coating's performance.

The technology developed by Purdue University researchers differentiates itself from existing competition by utilizing highly reflective and non-UV absorbing material to cool, protect, and preserve structures from excessive heat. The coating possesses commendable properties such as high elasticity and high thermal emittance that mitigate solar heating. Instead of thermoplastics, this technology uses stable thermoset materials, providing resolute protection against extremely harsh conditions and resistance to deformation. Versatile and durable, this coating technology can be used in many industrial and commercial applications, namely as roof coatings or as coatings for airplanes or outdoor equipment.

Technology Validation:

The researchers employed select compounds at a high-volume concentration into the coating to achieve high reflectance of 95.9%, 96.5%, and 94.5%, respectively. The coating demonstrated high reflectance in the solar region and high thermal emittance in the mid infrared region. The coating can be applied through rolling, brushing, or spraying.

Technology ID
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Category
Chemicals & Advanced Materials/Polymer Science & Smart Materials
Chemicals & Advanced Materials/Coatings, Adhesives & Sealants
Chemicals & Advanced Materials/Materials Processing & Manufacturing Technologies

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Advantages:

-Provides extreme protection to surfaces and mitigates durability issues

-Delivers high radiative cooling performance for industrial and commercial applications

-Utilizes thermoset materials that are protective against chemical degradation and harsh conditions

-Highly resistant to ponding water.

-Roof restoring applications.

Applications:

-Protective coating and paint manufacturing companies

-Oil and gas companies

-Companies located in extremely warm climates

TRL: 2

Intellectual Property:

Provisional-Gov. Funding, 2023-12-20, United States

PCT-Gov. Funding, 2024-12-19, WO

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