



Ultra-Cool Metal Roofing Material is Poised to Reduce Energy Needs

Place something in the sun, and it will heat up. The use of a reflective window shade in a car is a common way to prevent the interior from getting hot due to incident sunshine. Similarly, a building's light-colored roof heats up less than a dark roof, but both can get much hotter than ambient air temperature.

According to the U.S. Energy Information Administration (EIA), about 40% of total U.S. energy consumption in 2020 occurred in residential and commercial buildings. Cool roofing materials have the potential to reduce energy bills by decreasing air conditioning needs, extend service life by decreasing roof temperatures, and lower peak electricity demand, says the U.S. Dept. of Energy.

With funding from the National Science Foundation (NSF), PC Krause and Associates (PCKA) developed a passive radiative metamaterial that can serve as an economical, ultra-cool metal roofing product. A roof coated with such a novel metamaterial could stay remarkably cooler than its surroundings by radiating heat back past the Earth's atmosphere into space. Such coated roofing surfaces

could have a transformative impact on energy costs for residential and commercial buildings.

The technology required the creation of a film designed to absorb incident solar energy and emit it back at wavelengths within the atmospheric window, a range of wavelengths at which radiation does not heat atmospheric gases. This unique radiation band allows the material's thermal energy to escape to the cold heat sink of outer space without interacting with the atmosphere. If the amount of radiation emitted in this band is greater than

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