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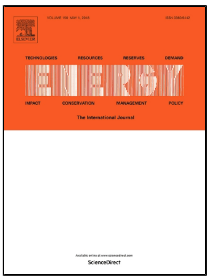

Comparative analysis of different surfaces for integrated solar heating and radiative cooling: A numerical study

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Comparative analysis of different surfaces for integrated solar heating and radiative cooling: A numerical study

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Abstract

The spectral selectivity of solar selective absorbing coatings enhances coating performance in diurnal heating collection but also limits the potential application of these materials in nocturnal radiative cooling. A radiative cooling surface shows poor solar heating performance due to the same reason. The present study proposed a novel surface that combines solar heating and radiative cooling (SH-RC) considering the spectral selectivity of photo-thermic conversion and radiative cooling. A hypothetical SH-RC surface was also proposed. This hypothetical surface had an absorptivity of 0.92 in the solar radiation band, emissivity of 0.70 in the "atmospheric window" band, and absorptivity (emissivity) of 0.05 in other bands. The thermal performance of this spectrally selective SH-RC surface (SH-RC_s surface) was numerically investigated by comparing it with three surfaces, namely, solar selective absorbing coating surface (SH surface), spectrally selective radiative cooling surface (RC surface), and spectrally non-selective black surface (SH-RC_{black} surface). Results indicated that