

Passive cooling of surfaces

Abstract

Radiative cooling of surfaces without applying an energy source has been suggested in the literature. The basis for radiative cooling is the infrared transmittance of the atmosphere. The spectral transparency (i.e. low absorption) of the atmosphere in the wavelength range of 8 to 13 μm is generally termed the atmospheric window. If the humidity and cloudiness are low, then the downward thermal radiation from the atmosphere in the spectral region of the atmospheric window are expected to be low. A temperature between 15 °C and 25 °C below ambient temperature has been achieved as a result of radiative cooling.

Spectrally selective radiating material, which is defined as a material with high emittance in the spectral region of the atmospheric window and high reflectance in the rest of the spectral range, can be used as an essential means in a sky radiator for passive cooling of the material. Silicon monoxide film on highly reflective substrate (aluminum coated glass) was used in the present work. It was found that the temperature of the thin film surface was about 12 °C lower than that of ambient temperature under suitable condition of radiative cooling. Cooling is expected to be more efficient in performance if it is carried out in desert places.

Keywords: *thin films, transmittance, radiative cooling, silicon monoxide*