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PASSIVE NIGHTTIME RADIATIVE COOLING USING BLACK SILICON

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ABSTRACT. Decarbonized and low energy technologies for heat management and conversion are a key milestone for climate change mitigation. Cooling is one of the major fields where such technologies are required. Passive radiative cooling in its nighttime and daytime versions is therefore a promising technology to achieve those goals. We consider in this work a silicon based nanostructured material with outstanding visible and infrared radiation absorption and emission capabilities, Black Silicon (BSi), as a candidate for nighttime passive radiative cooling. We compare BSi with its flat silicon counterpart and different depths of BSi nanostructuration with respect to their radiative cooling power. We show that BSi cooling power is significantly larger than that of flat silicon by a factor up to 1.8 at 30°C with a cooling power of 75 W /m² and 140 W/m² for flat and black Silicon, respectively.

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