Patterning of SiO2 surfaces for sub-ambient passive cooling under direct sunlight

Lorenzo PATTELLI – INRiM

Silicon dioxide (SiO2) is a prominent material for radiative cooling applications due to its negligible absorption at solar wavelengths (0.25-2.5 μm) and exceptional stability. However, at thermal infrared wavelengths, its bulk phonon-polariton band introduces a strong reflection peak inside the atmospheric transparency window (8-13 μm) which is detrimental to its selective emissivity. Scalable strategies for the patterning of ordered and disordered SiO2 surfaces will be presented, demonstrating the possibility to enhance their thermal emissivity and enabling sub-ambient passive cooling under direct sunlight. The emissivity enhancement is obtained without the use of deeply etched (> 5 μm) structures and large periods, which is promising to reduce manufacturing costs, etching times, and to increase compatibility with existing technologies.