ENGINEERING SURFACE EMISSIVITY FOR THERMAL CAMOUFLAGE

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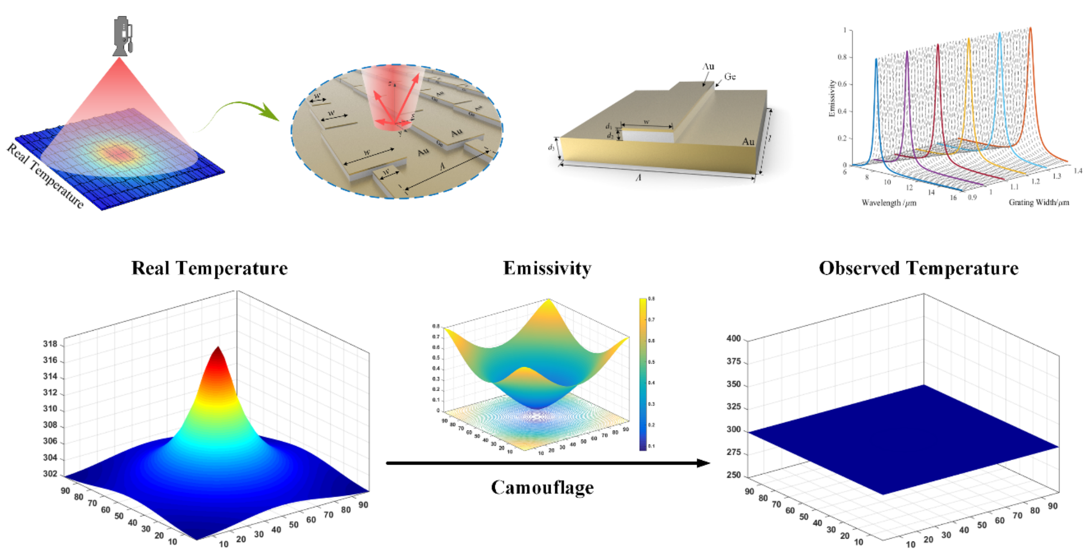
Thanks to the conductive thermal metamaterials, novel functionalities like thermal cloak, camouflage and illusion have been achieved, but conductive metamaterials can only control the in-plane heat conduction. The radiative thermal metamaterials can control the out-of-plane thermal emission, which are more promising and applicable but have not been studied as comprehensively as the conductive counterparts. In this paper, we theoretically demonstrate the emissivity-structured radiative metasurface to realize thermal camouflage, illusion and messaging functionalities. We employ the rigorous coupled-wave algorithm (RCWA) to calculate the surface emissivity of Au/Ge/Au microstructures, where the grating width distribution is quantified by minimizing the temperature standard deviation of the overall plate. Through this strategy, the hot spot in the original temperature field is removed and a uniform temperature field is observed in the infrared camera instead, demonstrating the thermal camouflage functionality. The related mechanism is attributed to the multiple magnetic polariton (MP) resonance. The present MIM-based radiative metasurface may open avenues for high-resolution emissivity engineering to realize novel thermal functionality and develop new applications for thermal metamaterials and metasurface.



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