



THE 2nd INTERNATIONAL CONFERENCE ON ADVANCED AND MULTIFUNCTIONAL MATERIALS (ICAMM'26)

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Metasurface-based Smart windows

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Abstract: We report a large-area smart window by combining nanosphere lithography with reversible silver electrodeposition. Self-assembled polystyrene spheres template a periodic nanohole Cr/Au transparent conducting electrode whose visible transmittance is 15 to 20 percent higher than a continuous metal film, with a sheet resistance of 8.9 ohm per square and a figure of merit of 80.6. In a silver nitrate electrolyte containing citric acid as a suppressor, bias reversibly plates and strips silver, tuning the device continuously among transparent, translucent and mirror states. At 555 nm the transmittance falls from 62 percent to near zero in 3 seconds and recovers in 5 seconds.

Keywords: nanosphere lithography, transparent conducting electrode, reversible electrodeposition, smart window, cyclic voltammetry