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High-contrast and fast electrochromic switching enabled by plasmonics ALBERT TALIN, Sandia National Labs, TING XU, ERICH WALTER, AMIT AGRAWAL, CHRISTOPHER BOHN, JEYAVEL VELMURUGAN, WENQI ZHU, HENRI LEZEC, NIST — With vibrant colors and simple, room-temperature processing methods, electrochromic polymers have long attracted attention as active materials for flexible, low-power consuming devices such as smart windows and displays. However, despite their many advantages, slow switching speed and complexity of combining several separate polymers to achieve full-color gamut has limited electrochromic materials to niche applications. Here we exploit the enhanced light-matter interaction associated with the deep-subwavelength mode confinement of surface plasmon polaritons propagating in metallic nanoslit arrays coated with ultra-thin electrochromic polymers to build a novel configuration for achieving high-contrast and fast electrochromic switching. The switchable configuration retains the short temporal charge-diffusion characteristics of thin electrochromic films while maintaining the high optical-contrast associated with thicker electrochromic coatings. We further demonstrate that by controlling the pitch of the nanoslit arrays, it is possible to achieve a full-color response with high-contrast and fast switching-speeds while relying on just one electrochromic polymer.

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