Tailored nanoscale properties of Ag nanoparticles incorporated $WO_3 \cdot 0.33H_2O$ nanohybrids and their efficient electrochromic device applications

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Herein, we have examined the efficient electrochromic performance of Ag embedded $WO_3 \cdot 0.33H_2O$ nanohybrids. A simple hydrothermal process was preferred to fabricate Ag-$WO_3 \cdot 0.33H_2O$ based hybrids. $WO_3 \cdot 0.33H_2O$ is the key element responsible for the colouring and bleaching state. The electrochromic performance improved greatly by surface modification which is attributed to surface plasmonic resonance (SPR) and increased electrical conductivity caused Ag nanoparticles. As a result, Ag-$WO_3 \cdot 0.33H_2O$ nanohybrids device shows a higher optical modulation, a larger coloration efficiency and faster switching responses with a bleaching time and a coloring time than $WO_3 \cdot 0.33H_2O$, making it attractive for practical application.