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The coupling of surface plasmons in periodic arrays of subwavelength holes[1] RUWEN PENG, ZHAOHUI TANG, ZHAN WANG, YONGJUN BAO, MU WANG, National Laboratory of Solid State Microstructures, Nanjing University — We demonstrate here that transmission optical enhancement originates not only from surface plasmons(SPs) but also from the coupling of SPs on the silver film perforated with a periodic array of subwavelength holes. We fabricate the structured silver films by coating the film with magnetron sputtering, and then drilling holes with focused-ion-beam facility. The optical measurements are in good agreement with numerical calculations based on the full-vectorial three-dimensional finite-difference time-domain method. The peaks in measured transmission spectrum have also been analytically indexed by using effective-dielectric-constant model. It is shown that the coupling of SPs leads to blue shift of transmission peaks, and increases with decreasing the thickness of silver films. We suggest that these properties open an unique way to tune electromagnetic wave in subwavelength optics.

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