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Interface States between two one-dimensional Hyperbolic Metamaterials IENG-WAI UN, TA-JEN YEN, Department of Materials Science and Engineering, National Tsing Hua University, Hsinchu, Taiwan, R.O.C — In this work, we investigate the interface state(IFS) between two 1D hyperbolic metamaterials(1DHMM). At first, we scrutinize the existence of IFS in three kinds of interface-dielectric/1DHMM, metal/1DHMM, and 1DHMM/1DHMM, respectively. We find that these interface states depend on three factors of thicknesses (a_d, a_m), dielectric constants (ϵ_d, ϵ_m), and the transverse momentum k_T in the 1DHMM. For the case of $a_d > a_m$, the 1DHMM behaves like metal(dieletric) as $k_T < k_T^{xc}$ ($k_T > k_T^{xc}$) because IFS exists in the dielectric/1DHMM (metal/1DHMM) interface. As for the case of $a_d < a_m$, no band crossing occurs and IFS can occur in the dielectric/1DHMM interface. Furthermore, we show the existence of the IFS between the dielectric-like 1DHMM and metallic-like 1DHMM. Notice that all IFS's appear in the plasmonic band gap of the 1DHMM, and the dielectric- or metallic-like properties of the 1DHMMs are strongly related to the symmetry of the band edge states; in addition, the band crossing occurs at the band center with $k_T = k_T^{xc}$ and is contributed from the material dispersion. In conclusion, we present a simple method to determine the existence of the IFS in three kinds of interfaces and the surface properties of 1DHMM from its bulk properties.

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