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标题: Surface metallic states in ultrathin Bi(001) films studied with terahertz time-domain spectroscopy

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摘要: Dynamical response of surface metallic states in single crystalline ultrathin Bi(001) films on Si(111) 7 x 7 surface was investigated at a spectral range of 0.1-12 THz by broadband terahertz time-domain spectroscopy. The observed transmittance increased with a decrease in the thickness, without showing a gap structure. The measured complex dielectric dispersion was analyzed using a Drude model, and the plasma frequency ( $\omega(p)$ ) and damping constant ( $\gamma$ ) were found to be inversely proportional to the thickness. The results strongly indicate the existence of surface metallic states, whose carrier density and damping constant are estimated to be  $3.08 \times 10^{19} \text{ cm}^{-3}$  and  $4.83 \times 10^{(2)} \text{ THz}$ , respectively. (C) 2012 American Institute of Physics. [<http://dx.doi.org/10.1063/1.4729149>]

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