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**Anisotropic surface plasma resonance in self-assembled ErSb quantum nanostructures of tunable shape and orientation** DANIEL OUELLETTE, Physics Department, University of California, Santa Barbara, HONG LU, Materials Department, University of California, Santa Barbara, SASCHA PREU, Chair of Applied Physics, Univ. of Erlangen-Nuremberg, Germany, JUSTIN WATTS, BEN ZAKS, MARK SHERWIN, Physics Department and Institute for Terahertz Science and Technology, University of California, Santa Barbara, ARTHUR GOSSARD, Materials Department, University of California, Santa Barbara — Incorporation of erbium during MBE growth of GaSb leads to various self-assembled, semi-metallic ErSb nanostructures. At the lowest concentration, spheres of diameter 4-5 nm are observed. By contrast, at 7-10% Er, ~5 nm diameter nanowires self-align along the $< 001 >$ growth direction, and at 15-20%, the nanowires align in the growth plane along the $< \bar{1}10 >$ direction. Light polarized along the wires is strongly attenuated over a broad range from THz to near-IR. By contrast, light polarized perpendicular to the wires experiences minimal attenuation apart from a very strong surface plasma resonance at 0.46 eV. Surprisingly, the resonant frequency of the nanospheres is slightly higher than that of the wires, despite the smaller depolarization factor. Motivated by this observation and estimates of the confinement energy, we construct an effective medium theory for the nanostructures which includes a single characteristic intersubband transition. This model provides an excellent description of the IR reflectance and transmittance over the whole range of Er concentration, in contrast to a model which excludes the effect of quantum confinement.

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