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Terahertz photoconductivity of mobile electrons in nanoporous InP honeycombs

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Abstract

Nanostructured semiconductors with favorable optoelectronic properties can be created by electrochemical etching, a fabrication process that is scalable for mass market applications. Using terahertz photoconductivity measurements, we demonstrate that nanoporous InP has an unusually long carrier recombination lifetime that exceeds 100 ns at low temperatures and low carrier density, and an electron mobility half that of bulk InP. Modeling confirms that these observations result from band bending with holes confined to the surface and electrons away from the pores.