
Electrochemical Formation and Optical Characterization of Porous InP

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Porous III–V semiconductors have attracted significant attention due to their distinctive structural and optical characteristics. Among these semiconductors, indium phosphide (InP) is known for its direct bandgap, high electron mobility, and chemical stability. Electrochemical etching enables the facile and low-cost fabrication of porous semiconductors. In this study, micro pores were created on (100) oriented n-type InP using a double-cell electrochemical etching process. Formation mechanism of the porous structures is examined as a function of different etching parameters, including acid concentration, current density, and etching time. Pore shapes and chemical compositions are examined using a scanning electron microscope with an energy dispersive X-ray spectrometer. Electrochemical etching with HF-based etchants produces micro-sized pores with varied morphologies, depending on the etching parameters. The application of a current density of 30 mA/cm² at a low etchant concentration is sufficient to generate triangular micro-pores. The extension of the etching time led to the formation of pores exhibiting a rectangular morphology. The impact of morphology on optical and carrier recombination properties is analysed using steady-state photoluminescence (PL) spectroscopy and time-resolved fluorescence lifetime imaging microscopy (FLIM).