



# Charge carrier distribution in free-standing porous GaP membranes studied by Raman spectroscopy

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## Abstract

Free-standing porous GaP membranes were fabricated by anodic etching of (111)-oriented crystalline substrates in H<sub>2</sub>SO<sub>4</sub> aqueous solution. The formation of a column-shaped porous structure with average structure dimension of 50nm was proved by SEM-investigations. Raman measurements on both as-grown bulk and porous GaP were performed. Porous membranes were measured under different filling condition of the pores either with air or with a methanol–ethanol mixture. The theoretically predicted downward shift of the surface-related mode situated between the LO- and TO-modes in spectra from porous membranes related to the environment change was detected. The spectra of porous membranes can be interpreted as a superposition of those of depleted surface layers and of GaP-skeleton containing free carriers. This interpretation is based on both a Schottky-model approach and a numerical solution of the Poisson-equation.