# Abstract

## Enhanced Nonlinear Optical Properties and Electrical Transport in Porous III–V Materials

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Chisinau 2004
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**Received**: Thu, 28 Feb 2002 09:15:59

Electrochemical nanotexturization of III–V materials such as GaP, InP and GaAs [1,2] is shown to sharply increase the efficiency of optical second harmonic generation and to induce an artificial birefringence necessary for phase matching [3,4]. Optimization of the shape of pores and air fill factor allowed one to provide material percolation and at the same time to reach maximum effective second-order susceptibilities and as high degrees of porosity as to fulfill the phase matching conditions. The nature of the porosity-enhanced nonlinear optical response in III–V compounds is discussed taking into account the results of both analytical analysis and experimental study. Electrical transport in free-standing membranes of III–V compounds subjected to nanotexturization proves to be governed by potential barriers caused by the overlapped surface depletion layers related to neighboring pores. We present the results of a systematic study of the kinetics of photoconductivity in porous III–V compounds as a function of the conditions of excitation (wavelength of the electromagnetic radiation, excitation power density) and sample temperature.

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