Obtaining Regular Porous Gallium Arsenide Surface by Electrochemical Etching.

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The end of the last century has seen a progressive move down in dimensionality of semiconductors. Quantum wires and quantum dots were exotic terms a decade ago, while now they are at the very basis of many devices, e.g. lasers and are the key to the development of the technology of the future, e.g. nanoelectronics [1]. In fact, many possible applications exploit the quantum confinement (e.g. in light emitting diodes) or the high reactivity of its surface (e.g. sensor applications) but to promote real and commercial devices one has to master its quantum sponge nature.

Currently, the most promising is to obtain porous semiconductors such as Si [1], GaAs, GaP [1]. A special place in this series takes GaAs in connection with the prospects of using it as a substrate for growing various heterostructures on which are created efficient sources of radiation (injection lasers, light-emitting diodes) and high-speed photodetectors systems for fiber-optic communication lines. Porous gallium arsenide became the object of many studies [2-3], as a result of which it is possible to receive regular pore structure predetermined dimensions.

Porous GaAs layers were obtained by electrochemical anodic etching of single crystal n-GaAs (111), doped silicon (concentration of majority carriers 1015-1018sm-3) in a cell with a platinum electrode. On the back of the GaAs wafer was done an ohmic contact. In the solutions used as electrolytes HF: C2H5OH = 2: 1, HF: C2H5OH = 1: 1, HF: C2H5OH = 1: 2.

The porous substrate were obtained at different etching conditions that lead to fluctuations in GaAs porosity of 30 to 55 percent and pores from Rather micro to nanometer. The electric current density was varied in the range from 50 to 200 mA / cm2, the etching time was 2-15 min.

Varying the electrolyte composition, time and conditions of etching is possible to obtain high-quality porous structure on the surface of gallium arsenide with deliberately planned parameters. Currently, research is being conducted on the use of these devices as solar cells and gas sensors.

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2. Waveguide structures based on porous indium phosphide / S. Langa, S. Frey, J. Carstensen et al. // *Electrochemical and Solid-State Letters.* – 2005. – V. 8, N 2. – P. C30 – C32.
3. Porous III – V compounds as nonlinear optical materials / I.M. Tiginyanu, I.V. Kravetsky.