Structure and Properties of Porous Silicon Films Obtained by Chemical Method

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Intensive development of semiconductor electronics is associated with creation and practical application of new materials, in particular by alternative low-cost methods for forming films of those materials. Formation of spatially inhomogeneous nanomaterials of frontal type, such as dispersion-like, island-like, variable-gap, hybrid and porous materials is one of main direction of nanotechnology.

We developed a method of obtaining nanoporous silicon films which is an alternative to electrochemical anodization chemical technology. Porous silicon films with a thickness of 1-10μm were obtained from chemical etching plates of porous silicon with p-type conductivity (KDB-10) and orientations (111) for 10-15 min at room temperature. It was used solution $HF:HNO_3:H_2O$, in which concentration of HF was 48% and concentration of HNO_3 - 70%. The obtained porous silicon heterostructures have different morphology depending on the duration of formation. The morphology of the obtained structures differs from that of anodized porous structures. They demonstrate asymmetric CVC which are sensitive to the applied mechanical tension. The influence of conductivity type, silicon carrier concentration and film thickness for por-Si to such structures on mechanical properties was studied.

The relative changes in capacitance of porSi-Si heterojunctions at changes of the applied voltage are investigated for different values of uniaxial pressure. These changes are accompanied with low power consumption and weak self heating of the samples as well as high output linearity and sensitivity to electromagnetic noise. As a characteristic of the effect was decreasing the influence of temperature on the capacity and its dependence on external pressure.

In our opinion, such structures can be used to create the sensors of mechanical tension.

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