жащих кремнийсодержащих слоев, подобные добавки нежелательны.

Таким образом, процесс удаления фоторезистивных защитных покрытий в зоне послесвечения плазмы СВЧ разряда имеет высокие количественные и качественные показатели, что делает его весьма перспективным для применения в технологии изготовления БИС и СБИС при использовании подложек диаметром 150, 200 и 300 мм в условиях автоматизированного производства.

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Summary

The results of experimental investigation the process of removing protoresistive protection layers in oxygen microwave discharge afterglow are presented. The process demonstrated a good characteristics and may be successfully used in very-large-scale integration (VLSI) processing with substrates diameter 150, 200 and 300 mm under conditions of fully automatized manufacture.

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TENSO-HALL EFFECT IN COMPENSATED SILICON

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The results of recent investigations show that semiconductor materials compensated with deep impurities are very sensitive to external perturbations: light, temperature, deformations. This is due to the properties of impurities to produce deep energy levels in the forbidden band of the crystal. The nature of their creation is related to compound complexes of impurity atoms, inhomogeneous distribution of impurity potentials in crystal volume and the strong mechanical stress of the crystal lattice. When subjected to deformations, the states of the crystal in the lattice change as well as its charge state. This has to lead to an essential influence on electric and photoelectric properties of the crystal [1]. Therefore, the study of properties of compensated semiconductor materials with deeply lying impurity levels for external mechanical perturbation is a most simple and efficient method of investigating the states of the impurity atoms. On the basis of these materials one could create principally new, sensitive strain gauge transducers.

For this purpose B-doped, S-compensated, Si -samples of specific resistance at room temperature ρ_0=40 Ohm/sm;1,47·10^2 Ohm/sm; 3,7·10^3 Ohm/sm, i.e. the samples with different degrees of compensation were fabricated. They were out to be crystallographically (100) oriented along a big edge of the parallelepiped. Their dimensions were 6x2x1 mm^3. Compression X and current were aligned with the axis (100). The choice of this alignment was due to the fact that just there the highest tensor resistance of n-type Si-samples was observed [2]. The experiments were carried out at room temperature: the dependence of the resistivity on compression X was measured.

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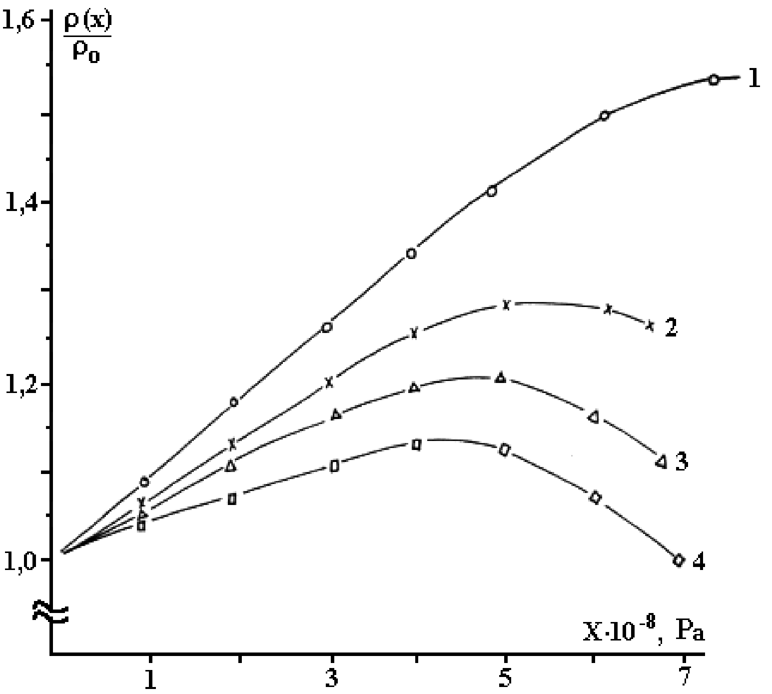

Fig. 1. Relative changes of resistivity $\rho(x)/\rho_0$ with compression.
1 – ρ_0=60 Ohm/cm (KEF-60); 2 – ρ_0=40 Ohm/cm Si <S>; 3 – $\rho_0=1,47\cdot10^2$ Ohm/cm Si <S>; 4 – $\rho=3,7\cdot10^3$ Ohm/cm Si <S>.

Fig. l depicts relative changes of resistivity $\rho(x)/\rho_0$ with compression. The curves show the change of the dependence with the change of ρ_0. For the sample with ρ_0=40 Ohm/sm a rapid increase of $\rho(x)/\rho_0$ (curve 2) is observed. It reaches maximum for $X=5,5\cdot10^8$ Pa, and then drops. With the increase of p o the maximum shifts towards weaker compressions X to decrease its value (curves 3 and 4).

To elucidate a mechanism of tensoresistance in compensated Si the Hall effect was studied for the action of uniaxial elastic compression on the same samples was investigated. With the use of experimental values for resistivity $\rho(x]$ and the Hall constant $R(x)$ we calculated concentrations $n(x)$ and Hall mobility $\mu(x)$ of charge carriers in the samples.

Fig. 2 shows relative changes of $n(x)/n_0$. As seen from the figurefor all samples with different initial resistivity ρ_0 the value of $n(x)/n_0$ grows with the increase of compression X, the less ρ_0 is, the faster it grows.

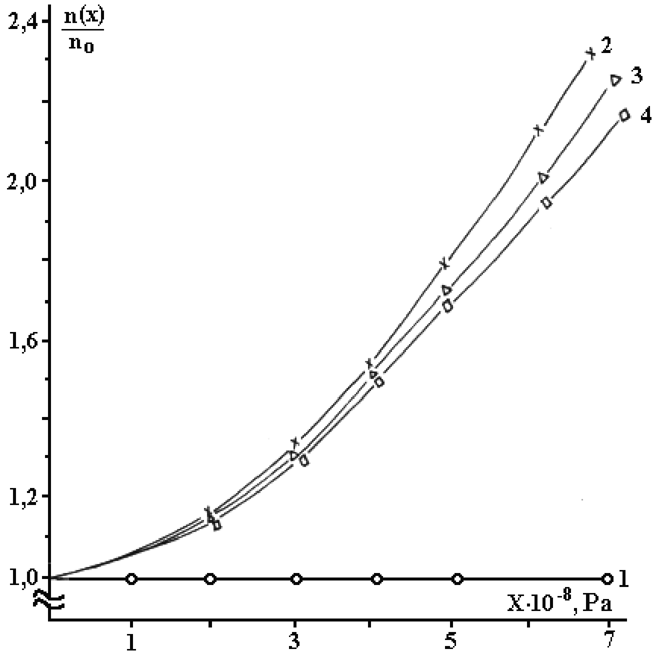

Fig. 2. Relative changes of concentration $n(x)/n_0$ with compression.

The curves for relative changes of the Hall electron mobility $\mu(x)/\mu_0$ vs the compression value arc drawn in Fig. 3. They show that electron mobility drops with the increase of crystal compression, the less ρ_0 is, the faster it decreases.

Under the same conditions for sake of comparison we investigated tenso-Hall effect for uniaxial compression in KEF-60 P-doped Si of resistivity ρ_0=600 hm/sm and n-type conduction, cut along the crystallographic axis(100). This investigation showed a natural change of resistivity (Fig. l, curve l), Hall mobility (Fig. 2, curve 1) and electron concentration (Fig. 3, curve l), which was first discovered by Smith and theoretically proved by Herring [3].

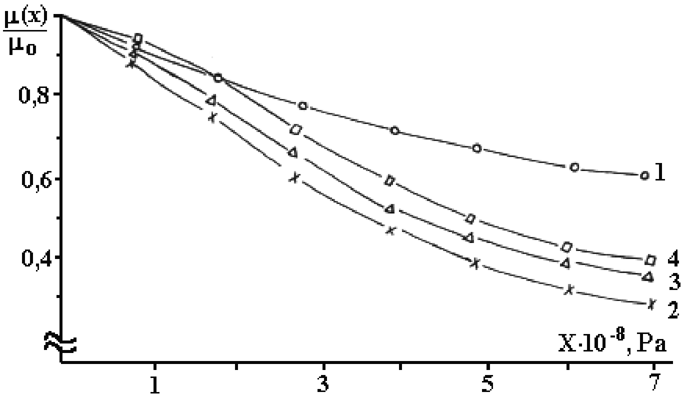

Fig. 3. Relative changes of the Hall mobility $\mu(x)/\mu_0$ with compression.

To explain such unusual changes in parameters of compensated Si unlike the uncompensated one for uniaxial elastic compression the following model is proposed. The decrease of mobility with the increase of compression *X* testifies to the displacement of the conduction band valleys. This is confirmed by the conservation of the Hall constant sign. The change of the Hall constant *R(x)* with compression will be affected both by mobility and concantration of electrons in valleys, as well as the shift of the deep-lying level to result in the change of its population by electrons. Thus, the occurrense of maxima in the dependences $\rho(x)/\rho_0$ in the case of compensated Si is associated with the “contrary” changes of mobility and concentration of conduction electrons.

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Summary

The Hall effect" for unaxial compression at temperature 300K has been investigated on Si, compensated with *S* of various concentration. The curves $\rho(x)/\rho_0$ from the uncompensated (with no *S*) crystals display saturation, in case of *S*-compensated crystals a maximum is observed. The concentration of free electrons in the uncompensated crystals was found to be independent of pressure. Their mobility decreases to saturate at the pressure of $7 \cdot 10^8$ Pa. In *S*-compensaled crystals free electron concentration increases with the rise of pressure, their mobility decreases, hence the curves $\rho(x)/\rho_0$ show maximum. The reason for the increase of the concentration of free electrons in S-compensated Si is elucidated.