Study of Electrical and Photoelectric Phenomena in Structures Based on Manganese Silicon Contact with Manganese High Silicon Membrane

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ABSTRACT

The physical properties of the manganese silicide layer formed on the silicon surface have been studied. The layer of manganese silicides was obtained by the solid phase reaction method on the silicon surface, in which a very pure manganese metal, a chemically refined monocrystalline silicon surface, was obtained. After the formation of manganese silicides on the surface of silicon, its crystal lattice structure, morphology and phase composition were studied using electron and electron microscope devices, electron microscope JXA-840 and electron microscope XL 30SFED. It has been shown that the formation of a layer of manganese silicon on silicon depends on the dynamic process of stable and unstable conditions.

KEYWORDS: *silicon, manganese high alkali, gas phase, atoms, diffusion, structure, surface, morphology, phase composition.*

MOS-Si <Mn> -M structures have a dielectric property of the device base according to the value of the dark current Jk, which passes through it at low temperatures, in the dark (without light) under certain voltages, and the structure looks like MOS-i-M confirmed the transition [1]. Spectral photoconductivity at low temperatures was tested in the structures and it was confirmed that the photocurrent in the field of private conductivity increases to 9÷10 order (at a set voltage of 5V) and the photocurrent relaxation after light is two-phase occurs only when current flows through MOS contact structures [1-4]. The photovolt-ampere characteristic (FVAX) in the structures was studied over a wide temperature range and the following conclusions were drawn: FVAX at room temperatures and VAX without linearity have a linear character; at low temperature (77 ÷ 270 K) FVAX is nonlinear, the photocurrent voltage dependence is $J \sim U^2$, J ~ U (3-4), MOS contact has the property of injecting holes [5].

The formation of the i-transition layer in structures in the formation of MOS on the silicon surface was determined by structural research and electrical measurements, and only when the current passes through this layer was confirmed very high photosensitivity, long-term photosensitivity relaxations, residual photoconductivity, deep infrared and thermal extinctions. The interval is explained [4-7].

On the basis of advanced scientific approaches accumulated to date in the example of manganese and silicon, the processes of mutual diffusion and reaction of substances at high temperatures, in the process of diffusion of manganese into silicon using high-tech modern tools [3], high silicon manganese (MOS) The main results of the study of the formation of 1.75-phase film and the electrical and photoelectric properties of silicon in contact with the film are as follows:

At high temperatures (1000-1200 ^{0}C) the diffusion of manganese into silicon proceeds in the reaction process, resulting in the growth of manganese silicon film on the surface layer of silicon;

The structure of the manganese silicon film, the element series of the phase depends on the temperature of the silicon (base) and the elastic vapor pressure of manganese was determined by calculating the chemical thermodynamic parameters: enthalpy, entropy and Gibbs free energies;

As a result of the research, a device and technology for targeted growth of manganese high silicon (MOS) film was developed.

The structures of grown manganese silicon membranes were studied by electron and X-ray diffraction. [3], the formation of manganese monosilicate MnSi was confirmed;

The study of the relationship between electrical conductivity and Hall's coefficient of temperature in grown MOS curtains showed that they have metallic conductivity at low temperatures and semiconducting at high temperatures (T> 300K), and the concentration of pores in them is r□1019-1020 cm-3.

The MnSi and MnSi1.71 + 1.75 phase curtains have a positive coefficient ter = 100-180 μV / grad measured over a wide temperature range, and the MnSi1.71 + 1.75 phase has a proportional advantage over the MnSi phase parda 200 / grad was determined to be [2-5];

The anisotropic thermoEYUK (ATE) properties of manganese silicon membranes were studied by the method of lowering the heat radiation to the surface of the membrane. The following results were obtained: and if the current-carrying contacts are taken in a direction perpendicular to these slopes, the change coefficient is around S = 500÷1000 μV / W, and if the current-carrying contacts are taken in a direction parallel to the slope, SE is less than two orders of magnitude. As a result of research, it was found that on the basis of MOS curtains it is possible to create measuring instruments that quickly record the power of the light source, temperature (this device is patented in Uzbekistan) [2];

MOS-Si <Mn> -M structures were modeled by studying the contact properties of the MOS membrane with the base silicon, and the temperature dependence of VAX, photo-VAX was studied for the first time. Structural studies have confirmed that MOS consists of tetrogonal and Si <Mn> cubic lattices, forming a heterophase transition between the MOS and Si <Mn> contacts [1-5].

In conclusion, we can conclude that in compensated Si <Mn> samples, only when the current is through the MOS phase contact, anomalous photo-VAX and, as a result, various photoconductivity phenomena occur.

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