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Inyaminov Y. A., Irisboyev F. B.
Assistant of the Department of Radioelectronics
Jizzakh Polytechnic Institute

IN THE TECHNOLOGY OF MANUFACTURING OF SOLAR ELEMENTS APPLICATION OF THE PHOTOLITHOGRAPHY METHOD

Abstract: The photolithography method has already been given high precision in semiconductor structuresa shape with topology is drawn and then it is technologically processed. A special photographic process on photoresist (light-sensitive polymer layers). Photoresists.

Key words: Photolithography, download a form using a photo templateSilicon oxide, transfer FR to the material,, Photoresists.

Иньяминов Ю. А., Ирисбоев Ф. Б.
Радиоэлектроника кафедры помощников
Джизакский политехнический институт

ТЕХНОЛОГИИ ИЗГОТОВЛЕНИЯ СОЛНЕЧНЫХ ЭЛЕМЕНТОВ И ПРИМЕНЕНИЕ МЕТОДА ФОТОЛИТОГРАФИИ

Аннотация: Метод фотолитографии уже придал высокую точность в полупроводниковых структурах: рисуется форма с топологией и затем технологически обрабатывается. Специальный фотографический процесс на фоторезисте (слои светочувствительного полимера). Фоторезисты.

Ключевые слова: Фотолитография, загрузка формы по фотошаблону, Оксид кремния, перенос ФР на материал, Фоторезисты.

Photolithography method and its essence. Modern microelectronics achievements largely depend on the use of the photolithography method. By this methodin structures, a form with a previously given topology is drawn with great accuracy and then it is processed technologically. With the help of this method, various materials, including projection images on dielectrics, semiconductor materials, and metals can be downloaded. Processing of materials (IaO, metal, dielectric) by photolithographic method (FLU). when given, first the necessary forms are made in a special light-sensitive material – photoresist is taken. Photoresist (FR) is imaged using special devices [1]. 1-3 using the FLU method With a micron size, shapes can be drawn with an accuracy of 0.2-0.6 µm. With the FLU method The main processes of obtaining a form are technological, which are carried out in the following order consists of actions [2].

- transfer FR to the material,
- photoresist strengthening,
- drawing a picture using a photo template,
- light the shape,
- erosion of unnecessary areas,
- remove excess FR.

Photoresists. FRs are light-sensitive materials that are exposed to light based on the phenomenon of change in solubility, the form is worked out. FRs are mostly UV activated by light. Photoresist is made of polymer materials and is positive and will be negative. If its solubility increases under the influence of light, it is called positive, if it decreases is called negative. Materials used in the photolithography method [3]. Preparation of the material during the photolithography process is important technologically is a process. When applying FLU, the following requirements are imposed on the sample.

1) The absence of defects on the surface of the sample (dirt, mechanical lines, etc.) [4].

2) Absence of various physical or chemical conditions on the sample surface (sample atoms other than the atom).

3) Selection of FR with the required adhesion. Sufficient thickness of the dielectric layers previously placed on the surface of the sample need [5].

The process of getting the FR layer on the surface of the sample. There are several ways to get the FR layer there is. One of these is to extract the FR layer using a centrifuge. At a certain speed FR in the form of a droplet is placed on the surface of the sample attached to the rotating centrifuge [6]. FR is observed to flow and form a thin layer during the process and from it evaporation of the solvent is observed until its viscosity reaches a certain level is used. The process continues until the FR flow stops. Usually the thickness for the formation of a uniform thin layer, the spin speed of the centrifuge is 1500-6000 rpm is desirable. The advantages of this method are the simplicity of the device, thinness it is possible to get layers [7].

In the spraying method, FR is sprayed onto the surface of the sample using compressed air. This method is FR gives the opportunity to get thick. One of the simplest methods is to immerse the sample in FR method. FR drying process. Drying FR in a thermal chamber or by means of infrared rays there are methods. Drying is carried out at 80-100°C, and in some cases at 120-140°C. Take a photo using a photo template. A photo template is a sample that you need to download the shape on it is in the form of a reflection (for negative FR) or itself (for positive FR) [8]. Overlaying and irradiating the photo-template with the sample is usually done on the same machine will be held. Superimposing a photo template with a sample is a privileged, responsible process, it is the action that determines the accuracy of the FLU. The overlap process is under the microscope will be held. After this process, this pair is illuminated, mainly by contact method is used. The light passing through the FR layer is partially absorbed and the photosensitive part of the FR activates. After the photoresist is activated by illumination, it is activated (i.e. light falling places) are absorbed by chemical method. As a result, the desired shape is formed. This the process is called "opening". "Opening" is done by immersion or pulverization method [9].

This control in the process is carried out under a microscope and the accuracy of the given form importance is given. The accuracy of the "opening" process depends on the temperature of the "opening reagent". depends on concentration and lighting time.

Forming in metal and dielectric layers. Forming in a thin layer first, a mask is created using FR, then a shape is created using FLU. One of the main steps in this process is chemical etching to form the shape. During chemical etching, only areas not protected by FR should be etched [10]. But in some cases, erosion can go not only inside, but also to the side. And this can cause partial distortion of the shape and decrease in accuracy. This is the process mainly depends on the adhesion properties of the selected photoresist.Forming a silicon oxide (SiO2) layer. For the absorption of FR obtained on SiO2 mainly chemical solutions are used. For example, 88-91% of 40% ammonium fluoride (NH4F) 9-12% volume solution is prepared from volume and concentrated 48% HF. Erosion speed can be 0.04-0.5 μm/minute depending on the conditions of the process. For controlled absorption of very thin layers, 15 ml of 48% HF, 10 ml of 70% HNO3, 300 ml of H2O is taken and the absorption rate is 0.012 μm/min [11]. Erosion of aluminum-based layers. Decomposing derived layers based on Aℓ acidic and alkaline solutions are used for Orthophosphorus as the main absorber acid is obtained. As an example, we give the following composition, 80-95 mlH3PO4 Q 5 ml When using HNO3 Q (1-20 ml) H2O at 40 oC, the rate of aluminum dissolution is 0.2 will be μm/minute. There are two opposing views on the influence of the base material on the QE properties. QE F.I.K. in order to substantiate the serious dependence of the base material on the width of the forbidden zone, it is necessary to analyze the element VAX and study the effect of the optical radiation spectrum falling on it. 1956 J. Lofersky completed the above-required theoretical calculation for the spectrum of solar radiation under Earth conditions - the book. The values of optical and photoelectric losses were evaluated for QEs made of different optimized materials. The results of such samples are shown in Figure 9 below. It can be seen from the picture that solar cells based on silicon material have a higher F.I.K. than the useful work coefficient [12]. the possibility of obtaining it is available in materials with a bandgap in the range of 1.1-1.6 eV. To obtain the maximum photoelectric efficiency (maximum F.I.K.) QE is determined using parameters A and Io related to VAX it is very important to determine the mechanism of the reverse saturation current passing through the r-p junction. In relation to the expansion of the spectral range of photoactive absorption of solar radiation, improving the above-mentioned parameters of the r-n transition is more likely to increase efficiency. In p-n junction solar cells based on homogeneous YaO' material, the p-n junction usually separates and collects excess non-primary charge carriers formed on both sides of it under the influence of light. The effective quantum output of the solar cell Qeff and the collection coefficient g are practically the same quantity, so we write these two quantities with the same sign and call it the collection coefficient Q. This physical quantity is the ratio of the number of electron-hole pairs that have passed through the r-n transition and are separated by excess charge carriers formed by optical radiation. Q is equal to the sum of the summation coefficients of the p- and n-fields, just like the currents flowing through an p-n junction [13].

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