

PRODUCTION OF SILICON SURFACE -BARRIER DETECTORS

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Several types of semiconductor detectors for experiments in nuclear physics have been developed in the Institute. Recently, two types of silicon surface-barrier detectors have been mostly in use, the detectors in lava housing and the detectors in teflon housing. The former type has been used mostly for the investigation of neutron-induced nuclear reactions and the latter type for the detection of fast electrons. High-grade silicon of between 1000 and 15000 Ohm cm is acquired from the firms Monsanto (USA), Societe de la Vielle Montagne (Belgium) and Wacker (W. Germany). A standard procedure of grinding, etching and washing is applied using high-grade agents. Immediately after drying the ohmic contact is made by vacuum evaporation of aluminium. The rectifying contact is achieved by oxidation in air for at least three weeks and by subsequent vacuum evaporation of a thin ($50 \mu\text{m}$) layer of gold.

The detectors in lava housing are mounted using p-type and n-type epoxy resins. Their performance is standard, and about 60% of the produced detectors are of satisfactory quality. The detectors in teflon housing are made for use at liquid-air temperature. Essentially, each produced detector is of good quality. The best results for the energy resolution of 324-keV electrons (K-conversion electrons in the decay of ^{113}Sn) are 4.5 keV, while a standard result is about 6 keV for the detector of 250 mm^2 sensitive area. These detectors have been recycled several times down to liquid-air temperature and back to room temperature, without any visible deterioration of performance.