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THIN-WINDOW MOUNT FOR NaI SCINTILLATION CRYSTALS

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THIN-WINDOW MOUNT FOR NaI SCINTILLATION CRYSTALS

Charles D. Goodman and John L. Need

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Thin-Window Mount for NaI Scintillation Crystals

A simple method of canning NaI crystals in thin window mounts for charged particle detection is described. No special materials are required. Crystals canned in this manner with 1.3 mg/cm^2 aluminum windows have given good energy resolution and last indefinitely.

The mounted crystals can be handled in room air and are convenient for stockpiling. From a supply of crystals of various thicknesses the desired crystal can readily be selected and placed on a multiplier phototube. This arrangement is useful, for example, for counting alpha particles in the presence of protons.

The mount consists of a Pyrex disk, an aluminum ring, and an aluminum foil window as shown in Fig. 1. The aluminum ring is machined so that its thickness and the diameter of the center hole are large enough to provide about 1/32 in. clearance all around the crystal. The aluminum foil window is then cemented to the top of the disk with shellac as follows: ordinary four-pound-cut orange shellac is painted on each of the two surfaces to be joined. Care is taken to get no shellac on the open-window area of the foil. When the shellac is dry, the aluminum ring is heated, either on an electric hot plate or under an infra-red heat lamp, until the shellac melts. The foil is then pressed onto the ring.

One face and the edges of the NaI crystal are ground on 400 grit abrasive paper in a dry box at a relative humidity less than 7 percent. The crystal is centered on the Pyrex disk with the ground side against the glass. A small lump of paraffin is placed at the edge of the crystal. The assembly is heated with an infra-red lamp in the dry box, until the paraffin flows under the crystal. When the glass has cooled completely, the excess wax is scraped off and the upper face of the crystal is ground with the abrasive paper. Then the aluminum ring is placed over the crystal and paraffin placed around the edge of the ring. The assembly is then heated again until the paraffin flows under the ring. The groove in the ring prevents the paraffin from flowing to the crystal space.

Enough clearance must be provided around the crystal to prevent the paraffin from being drawn over it by capillary action. If the seal is good, the foil will become concave as the mount cools.

Optical contact between the pyrex and the multiplier phototube can be made with conventional material such as high viscosity Dow-Corning number-200 fluid or stopcock grease.

Crystals prepared as described above give better than 10 percent resolution for the Cs^{137} gamma ray and better than 5 percent for 8-Mev alpha particles. No deterioration has been observed after four months of use.

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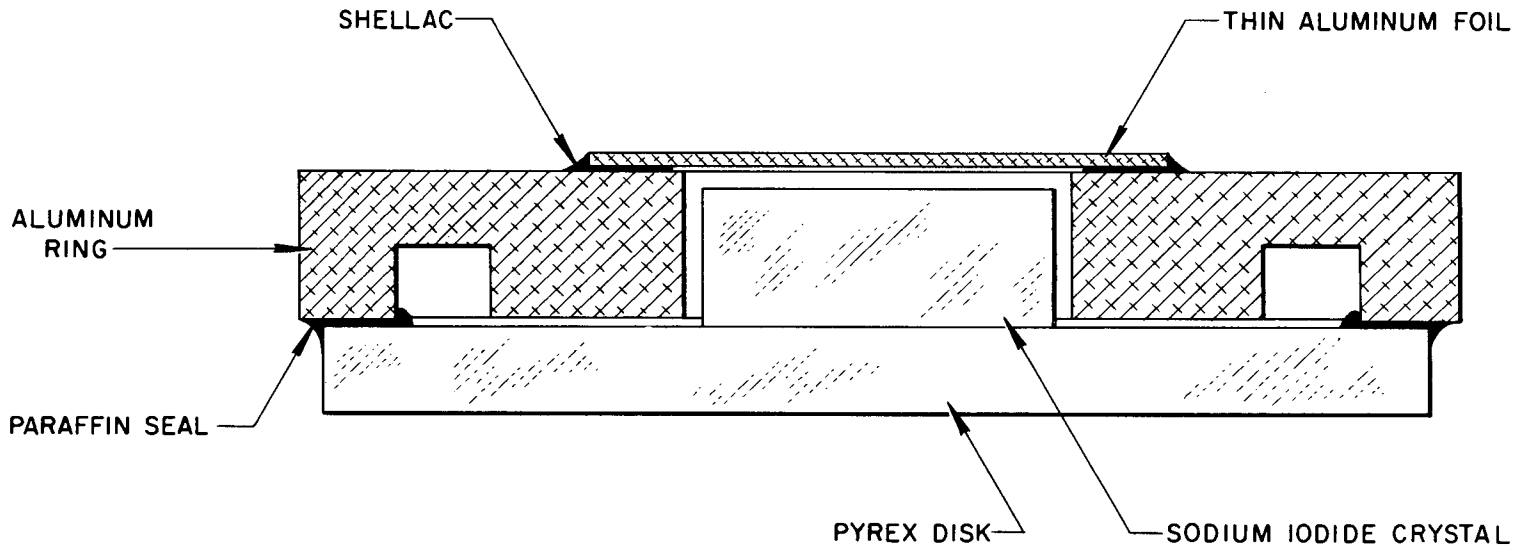

Fig. 1. Thin-Window Mount for NaI Scintillation Crystal.