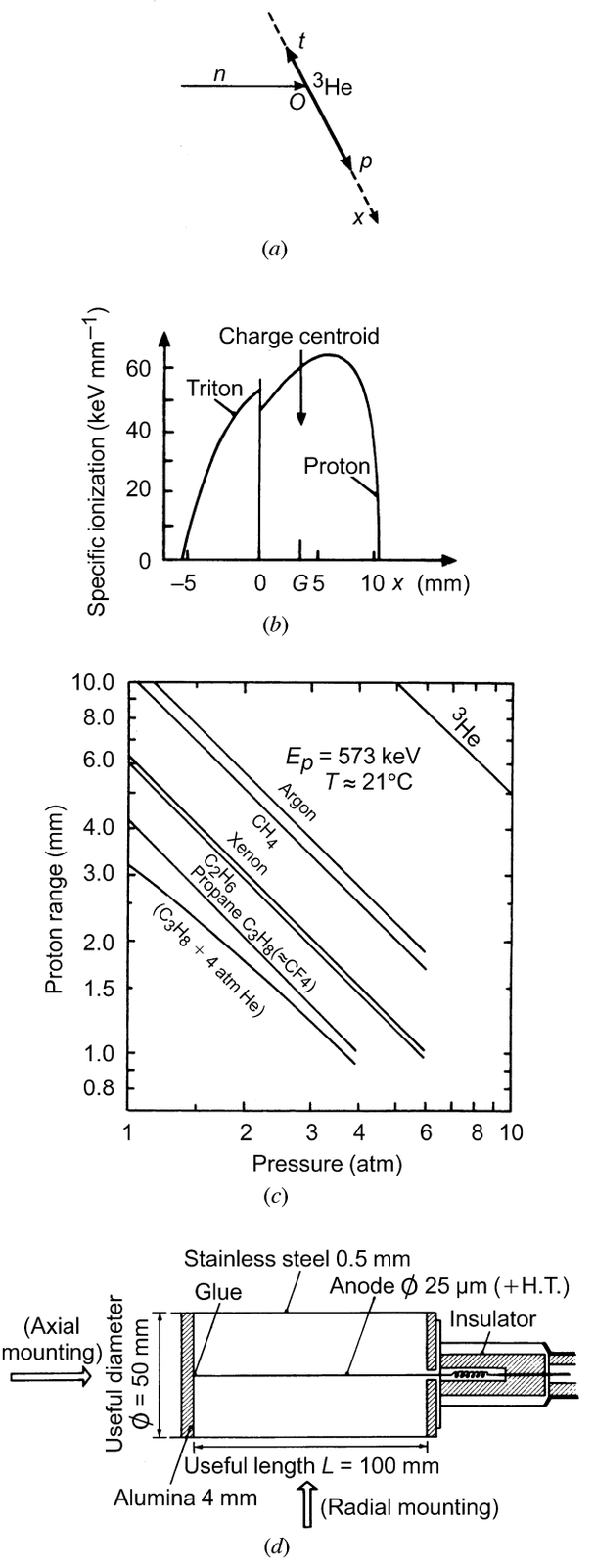

Fig. 7.3.3.1. (*a*) Neutron capture by an ^{3}He atom and random-direction trajectory (*Ox*) of the secondary charged particles in the gas mixture. (*b*) Calculated specific ionization along the proton and triton trajectory in a 65% ^{3}He/35% CH_4 mixture at 300 K and atmospheric pressure (Whaling, 1958). [Reproduced from Convert & Forsyth (1983).] (*c*) Range of a 0.57 MeV proton (from ^{3}He neutron capture) as a function of the pressure of various gases. [Reproduced from Convert & Forsyth (1983).] (*d*) Schematic drawing of a gas monodetector. The arrows represent the incoming beam.

converter, the conversion electrons are emitted isotropically, with a main energy peak at 72 keV, and collected by an X-ray film in close contact with the converter (Baruchel, Malgrange & Schlenker, 1983).

In addition to the advantages given by the film technique in itself (simplicity, low price, direct picture, *etc.*), neutron photographic methods give the best spatial resolution. However, the resolution is inversely related to the detector efficiency and thickness. A good compromise appears to be a thickness of 0.25 mm for a plastic scintillator [*i.e.* a capture efficiency of about 12% and a resolution of 0.1 mm for a one-screen converter at $\lambda = 1$ Å; see the size of the ionization volumes in a scintillator, Fig. 7.3.3.3(*a*)]. Here, however, as in light scattering, the optical density depends on the exposure time as well as on the incoming flux (Schwartzschild effect), which necessitates a calibration (Hohlwein, 1983). For a natural Gd-foil converter, an optimum thickness is 0.025 mm, giving a resolution of 0.020 mm. The Gd-foil film detector is one order of magnitude

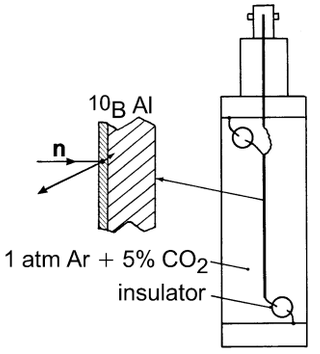

Fig. 7.3.3.2. Typical design of a ^{10}B-foil detector.

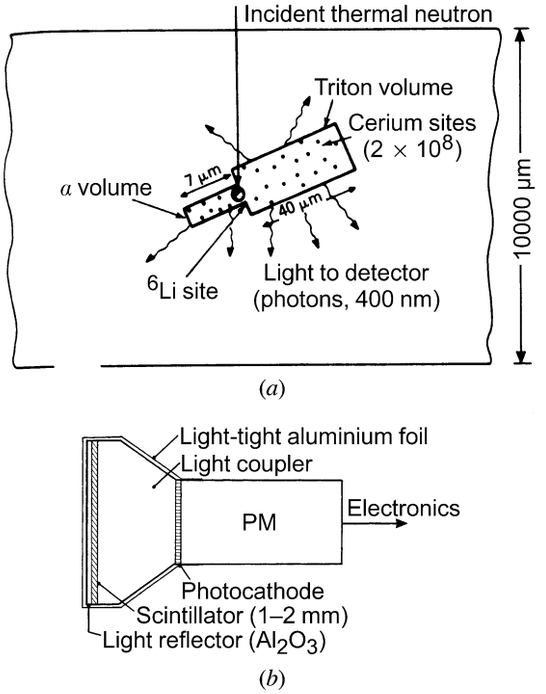

Fig. 7.3.3.3. (*a*) Schematic representation of the neutron capture, secondary α, and triton ionization volumes, and scintillator light emission in a cerium-doped lithium silicate glass. [Reproduced from Convert & Forsyth (1983).] (*b*) Schematic representation of a scintillation detector.

references