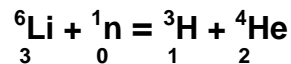


EJ-420 THERMAL NEUTRON DETECTOR

The EJ-420 detector is an efficient detector of thermal neutrons in the presence of gamma radiation. The detector employs a lithium compound, whose Li content is enriched to 95% ${}^6\text{Li}$ dispersed in a ZnS (Ag) matrix. Its design represents an improved version of that reported by Stedman. Efficient measurements of thermal neutron fluxes may be performed in the presence of gamma radiation as high as 10^7 gamma rays per neutron.

In most applications, EJ-420 will give counting efficiencies up to 100% greater than those attainable with similar detectors based on ${}^{10}\text{B}$. The efficiency is dependent on the neutron energy and is approximately 30% for 0.1 eV neutrons and 60% for neutrons of energy 0.01 eV or less. The detection efficiency for thermal neutrons of about 0.025 eV is approximately 55%. The attainable detection efficiency in a particular application will, of course, also depend on the competing gamma ray background.

The detection process in EJ-420 depends on the nuclear reaction ${}^6\text{Li} (n, \alpha) {}^3\text{H}$:



with a cross section of 910 barns for 0.025 eV neutrons. The resulting triton and alpha particle are efficiently detected in a ZnS (Ag) phosphor especially selected for short decay time characteristics.

For typical applications EJ-420 is optically bonded to the photomultiplier with clear silicone grease or fluid. It may be surrounded by an appropriate quantity of hydrogenous material for neutron thermalization. The neutron flux is determined above a desired rejection ratio of gamma radiation or photomultiplier noise by setting the pulse height analyzer or discriminator of the associated electrical equipment to an appropriate level. This is adequate for most applications, but if the flux of gamma rays is very high, pulse shape discrimination may be effectively used.

Lithium-6 content: 9 mg of ${}^6\text{Li}$ per cm^2
Pulse Height: 120% NaI(Tl)
Wavelength of maximum emission 450 nm
Decay Time (principal short component):..... 0.2×10^{-6} sec.

Standard Sizes: 1" (25mm) dia. x $\frac{1}{4}$ " (6.5mm) Other sizes available by request.



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