

# ZnS(Ag) Zinc Sulfide Scintillation Material

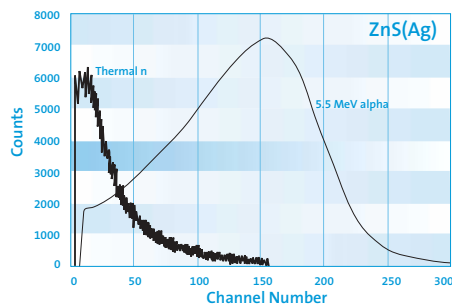
Silver activated zinc sulfide has a very high scintillation efficiency comparable to that of NaI(Tl). It is only available as a polycrystalline powder.

ZnS(Ag) has a maximum in the scintillation emission spectrum at 450nm. The light conversion efficiency is relatively poor for fast electrons which may be an advantage when detecting heavy ionizing particles in a relatively intense  $\gamma$ -ray background. Scintillation decay times between several hundreds of ns and 10 $\mu$ s are reported and phosphorescence of still longer duration has been noted.

Thicknesses greater than about 25 mg/cm<sup>2</sup> become unusable because of the opacity of the multicrystalline layer to its own luminescence.

Its use is limited to thin screens used primarily for  $\alpha$ -particles or other heavy ion detection. The main application of ZnS(Ag) is in  $\alpha$ -particle monitors.

The figure below shows the energy spectrum response for 5.5 MeV



**Figure 1.** Spectra for thermal neutron and 5.5 MeV alpha response of ZnS(Ag)

incident  $\alpha$ -particles. The broad peak is clearly above the electronic noise.

ZnS(Ag) can be used to detect thermal neutrons if a lithium compound enriched in <sup>6</sup>Li is incorporated. The alpha particle and triton from the <sup>6</sup>Li (n,  $\alpha$ ) <sup>3</sup>H reaction produce scintillations upon interacting with the ZnS(Ag). The figure also shows a thermal neutron spectrum.

Another use for ZnS(Ag) is for the detection of fast neutrons. A fast neutron detector is made by imbedding the ZnS(Ag) in a clear hydrogenous compound. The neutrons are detected by measuring the recoiling proton from a neutron proton scattering interaction. The protons will have a broad spectrum of energies up to the energy of the incident neutrons.

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**Properties –**

Density [g/cm <sup>3</sup> ] .....	4.09
Cleavage plane .....	polycrystalline
Wavelength of emission max. [nm] .....	450
Lower wavelength cutoff [nm] .....	330
Refractive index @ emission max .....	2.36
Photoelectron yield [% of NaI(Tl)] (for $\gamma$ -rays) .....	130
Decay constant [ns] .....	110

Scintillation Products

**ZnS(Ag)**  
**Zinc Sulfide**  
**Scintillation Material**



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3111(06-02)