NaI(Tl+Li)
Neutron-Gamma Scintillator

NaI(Tl) crystal containing ^{6}Li for neutron detection

NaIL is a game-changing scintillation material for gamma-ray and neutron dual detection. ^{6}Li (95% enriched) co-doping introduces efficient thermal neutron detection to the most established gamma-ray scintillator while retaining the favorable scintillation properties of standard NaI(Tl).

Excellent solution for area monitoring

Up to 57% efficient for thermal neutrons

Similar gamma ray performance as standard NaI:Tl

The NaIL advantage

Uniquely, NaIL can provide large volume, single material detectors for both gammas and neutrons at low price per volume. Consider the following:

- It is easy and cost effective to grow large NaI crystals.
- Sodium and iodine barely compete with ^{6}Li for neutron attenuation.
- Using low ^{6}Li concentrations and large thicknesses achieves neutron detection capabilities as good as ^{3}He or CLYC or CLLB detectors at a lower cost.
- Large volume detectors add efficient gamma ray spectral detection. There is no longer a need to compromise on the detectability of one specie to be efficient for the other.

50x100x200 mm³
2”x4”x8” NaIL

Material	NaI:Tl + 1% ^{6}Li
Density	3.66 g/cm3
Decay constants gamma neutron	 240ns, 1.4µs 230ns, 1.1µs
Light yield	35k photons/MeV
Thermal neutron GEE	3.2 MeV
Peak emission wavelength	419 nm

Currently in pre-commercialization phase and material performance subject to change.

CRYSTALS

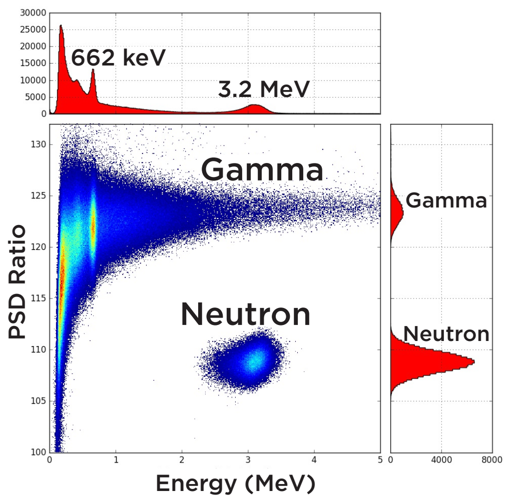
SAINT-GOBAIN

NaIL™ Neutron-Gamma Scintillator

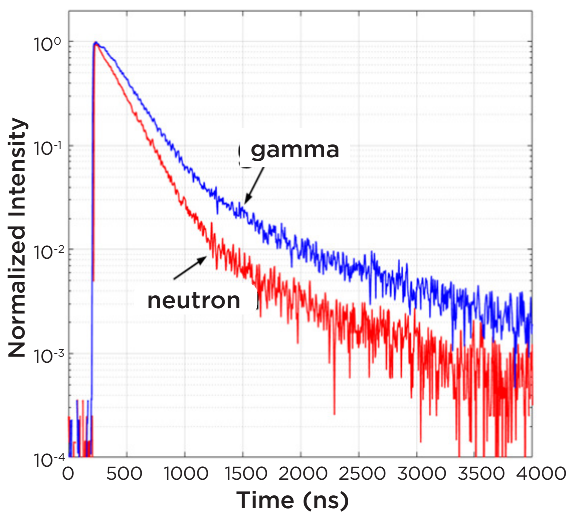
Straightforward gamma and neutron separation

Neutrons and gamma rays are easily distinguished through pulse shape discrimination (PSD). With the addition of Li into the NaI matrix, gamma ray scintillation pulses become longer than neutron reaction pulses. The effect is dramatic, and simple PSD techniques create complete separation.

When considering neutron detection capability, often the metric A*ε is used. A is the detector area and ε is the probability of detecting an impinging thermal neutron. When price and gamma detection ability are factored in, NaIL often becomes the best solution.

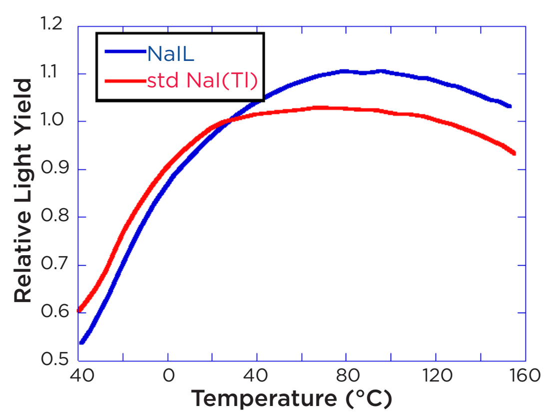


Detector	n_{th} detection capability A*ε (cm^2)
NaIL ∅ 50 x 50 mm	13
NaIL ∅ 50 x 100 mm	26
NaIL 50x100x400 mm^3	216
^{3}He ∅ 13 x 50 mm, 8 atm	7
^{3}He ∅ 50 x 1830 mm, 2.9 atm	613
CLYC ∅ 50 x 50 mm	20
CLLB ∅ diameter 50 x 50 mm	22



Relative to standard NaI:Tl performance

The scintillation properties of standard NaI(Tl) are preserved. Energy resolutions of 6.5-8% at 662 keV are typical even for large crystals. Light yield is slightly lower, but still substantial at approximately 35k photons/MeV. Furthermore, the scintillation properties of NaIL degrade less at high temperature than standard NaI(Tl).



Saint-Gobain Crystals

www.crystals.saint-gobain.com

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