May 30, 2024

Why is Afterglow Important in Scintillation?

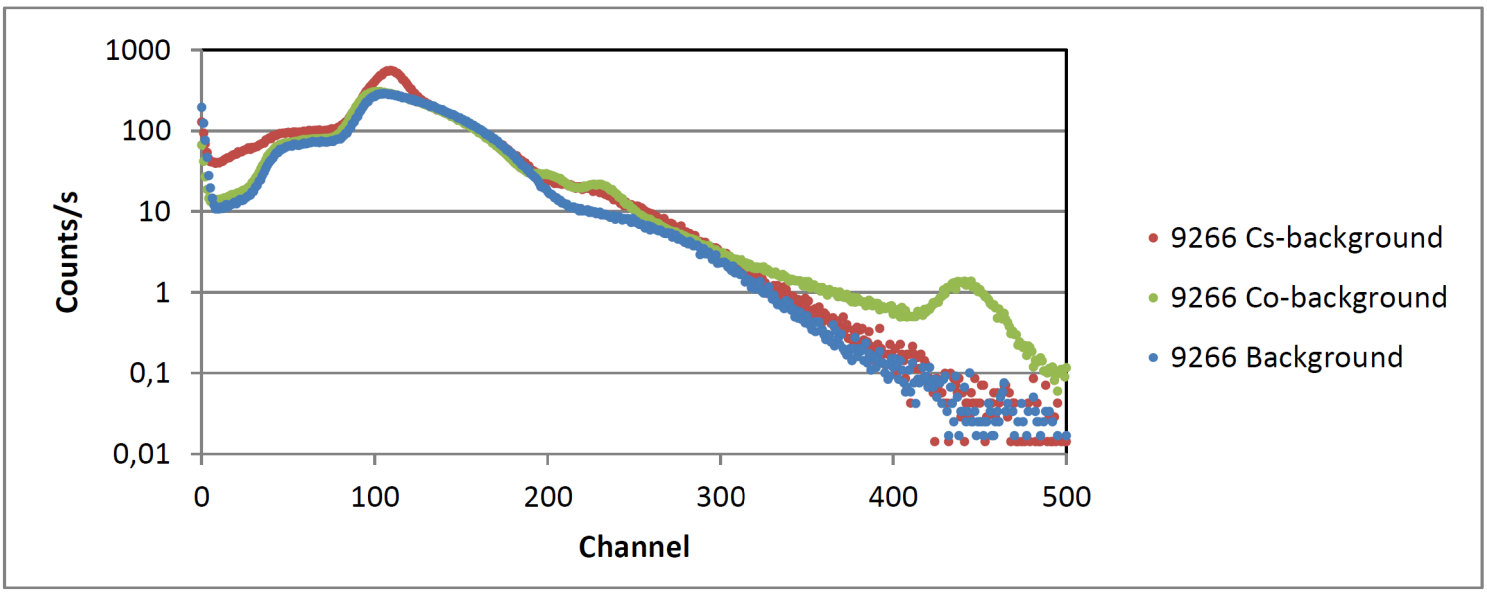
Blog Post

One property of scintillation is afterglow, defined as the fraction of scintillation light still present for a certain time after the radiation energy, including gamma ray or x-ray, excitation stops. When the scintillator detects any incoming radiation, depending on the quality of crystal material, the radiation charged particles can be trapped in impurities or structural crystal defects. This is what causes the afterglow effect in a variety of scintillators, and manufacturers in novel scintillation materials aim to reduce this excess in charged particles emitting light.

In several medical imaging applications such as PET, afterglow must be reduced to prevent energy resolution degradation. PET imaging and other high energy physics applications require rapid response and precise measurements. Afterglow can reduce the quality of measurements achieved, which is why it's important to be reduced.

Often the afterglow effect, the fraction of scintillation light still present, can last for several minutes after the initial measurement influencing the scintillation properties. To ensure the sensitivity and accuracy of radiation measurement is preserved, it's important to reduce afterglow in detection.

There are many materials BNC offers that can provide low afterglow, notably LYSO, BGO, and LaBr. LYSO is often the best choice for PET medical imaging because of its higher lighter output and lower afterglow compared to BGO.



This figure shows the results obtained with PMT 9266 for 3 different scenarios: without any source, with 137Cs next to it and with 60Co. Clearly visible is the contribution of the 137Cs peak, as well as the two peaks from 60Co. For the latter one the sum peak around channel 450 can be seen clearly as well.

Material	Density (g/cm3)	Emission Maximum (nm)	Decay Constant (*)	Refractive Index (*)	Conversion Efficiency (***)	Hygroscopic
LYSO	7.20	420	50 ns	1.82	70 - 80	No
BGO	7.13	480	0.3 us	2.15	15 - 20	No
LaBr	5.08	380	21 ns	1.89	140	Yes

The crystal growth process and purification of materials can help reduce afterglow. Scintillators can undergo codopants to reduce afterglow as well, but this process can reduce other scintillation properties like energy resolution and cause lower light yields. BNC aims to provide high quality materials for high energy physics, medical imaging, neutron diagnostics applications and many more! Have any questions about afterglow or looking for a recommendation for your application? Please contact us.