

Scintillation Detectors



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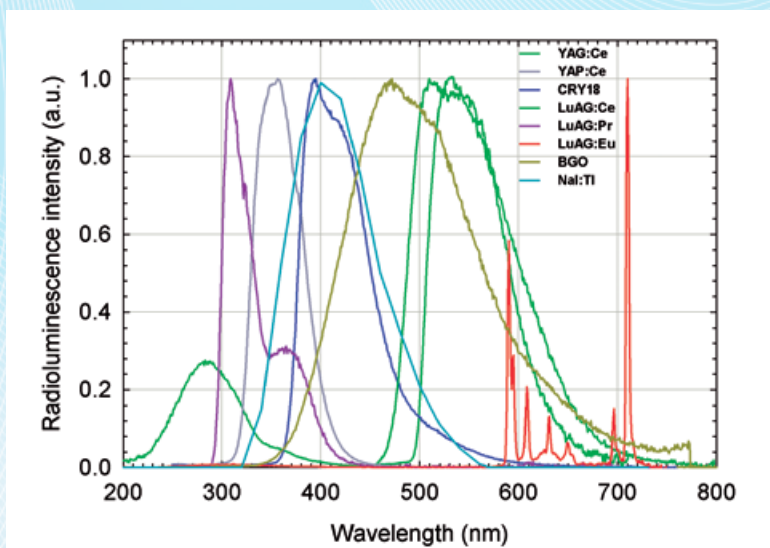
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Scintillation Detectors

	YAG:Ce	YAP:Ce	LuAG:Ce	CRY18	CRY19	YAG:Pr	LuAG:Pr	CaF:Eu	CsI:Tl	BGO	NaI:Tl
Physical properties											
Density [g/cm ³]	4.57	5.37	6.73	4.5	7.1	4.57	6.7	3.18	4.51	7.13	3.67
Hardness [Mho]	8.5	8.6	8.5	5.8	-	8.5	8.5	4	2	5	2
Index of refraction	1.82	1.95	1.84	1.79	1.81	1.82	1.84	1.44	1.78	2.15	1.85
Crystal structure	Cubic	Rhombic	Cubic	Monoclinic	Monoclinic	Cubic	Cubic	Cubic	Cubic	Cubic	Cubic
Melting point [°C]	1970	1875	2020	1980	2100	1970	2020	1360	621	1050	651
Hygroscopic	No	No	No	No	No	No	No	Yes	No	No	Yes
Linear coef. thermal expansion [10 ⁻⁵ /K]	0.8-0.9	0.4-1.1	-	-	1.8-10.3	0.8-0.9	-	1.95	5	0.7	4.75
Cleavage	No	No	No	Yes	Yes	No	No	No	Slightly	No	Yes
Chemical formula	Y ₃ Al ₅ O ₁₂	YAlO ₃	Lu ₃ Al ₅ O ₁₂	-	-	Y ₃ Al ₅ O ₁₂	Lu ₃ Al ₅ O ₁₂	CaF ₂	CsI	Bi ₄ (GeO ₄) ₃	NaI
Luminescence properties											
Integrated photoelectron output [% NaI:Tl]	40	70	20	80	75	40	66	50	45	15-20	100
Wavelength of max. emission [nm]	550	370	535	425	420	310	310	435	550	480	415
Decay constant [ns]	70	25	70	45	41	20	20	940	900	300	230
Afterglow [% at 6 ms]	<0.005	<0.005	-	-	-	-	-	<0.3	<2	<0.005	0.5-5
Radiation length [cm] for 511 keV	3.5	2.7	1.3	2.74	1.2	3.5	1.3	3.05	1.86	1.1	2.9
Effective atomic number Z _{eff}	29.5	31.4	58.9	32.9	58.2	29.5	58.9	35.6	54.0	71.7	49.8
Photon yield at 300 K [10 ³ Ph/MeV]	35	25	25	30	24	13	16	23	52	8-10	38

Table of basic parameters of scintillation crystals



Emission spectra of common single-crystal scintillators