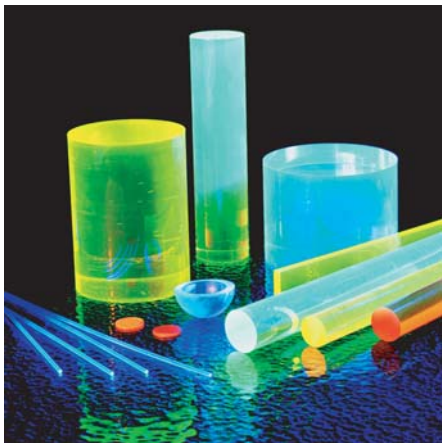
PLASTIC SCINTILLATORS



Plastic scintillators are a solid solution of luminophors (luminescent additives,) in a transparent polymer (polystyrene (PST).

Many characteristics of plastic scintillation materials (light output, transparency to own emission, decay time, radiation resistance) can be varied by changing their composition.

Polystyrene–based scintillators

Scintillators with a polystyrene matrix are used to detect α-, β-, and γ-radiation, and fast neutrons.

Plastic scintillators are prepared by bulk polymerization in aluminium (size up to 3.5 m) or glass cast and by pressure molding technique.

By varying the composition, we can produce:

- ◊ fast plastic scintillation material: decay time from 0.9 to 0.5 ns;
- ◊ radiation hard plastics;
- ◊ scintillation polystyrene with the light scattering additive;
- ◊ scintillation polystyrene containing soluted organic compounds of heavy elements (Pb -12%, Sn -10%).

	Polystyrene (PST)
Density [g/cm^3]	1.06
Refractive index	1.60
Absorption coefficient [cm^{-1}]	0.01-0.003
Softening [K]	355-360
Hygroscopic	no
Emission peak [nm]	430
Light output [% of anthracene]	56
H/C ratio	1.0
Decay time [ns]	2-3

Selector guide for plastic scintillators.

Scintillator	Important property	Application comments
UPS-89, UPS-923A, UPS-90, UPS-96	High light output, good transparency, short decay time	General purpose, partical detection
UPS-91F	Ultra fast decay time	High energy physics
UPS-92RH	Radiation hard	High energy physics
UPS-96M		High energy physics
UPS-976, UPS-971, UPS-972, UPS-973,	Various maximum emission	Operation with fiber shifter

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Scintillator type	Light output % anthracene	Emission peak, nm	Rise time, ns	Decay time, ns	Light attenuation length, cm	Analoges
UPS-89	65	418	0.9	2.4	360	NE102A
UPS-923A	60	425	0.9	3.3	400	BC400, NE114
UPS-90	50	418	1.0	3.5	400	NE110
UPS-92S	44	380	0.9	380-450	350	BC412, NE115
UPS-91F	39-45	390	0.7	0.6-0.4	–	PilotV, BC422Q
UPS-92RH	60	425	–	3.5	350	SCSN81
UPS-96M	55	418	1.0	3.5	60	none
UPS-97G	60	425	0.9	3.3	250	BC444
UPS-971	55	425	0.9		400	none
UPS-972	44	435	0.9		400	none
UPS-973	45	445	0.9		400	none
UPS-974	53	480	0.9		400	none