Table 12.2: Properties of several inorganic crystal scintillators.

	NaI(Tl)	BGO	BaF_2	CsI(Tl)	CsI(pure)
Density (g/cm^3)	3.67	7.13	4.89	4.53	4.53
Radiation length (cm)	2.59	1.12	2.05	1.85	1.85
Molière radius (cm)	4.5	2.4	3.4	3.8	3.8
dE/dx (MeV/cm) (per mip)	4.8	9.2	6.6	5.6	5.6
Nucl. int. length (cm)	41.4	22.0	29.9	36.5	36.5
Decay time (ns)	250	300	0.7^f	1000	$10, 36^f$
			620^s		$\sim 1000^s$
Peak emission λ (nm)	410	480	220^f	565	305^f
			310^s		$\sim 480^s$
Refractive index	1.85	2.20	1.56	1.80	1.80
Relative light output	1.00	0.15	0.05^f	0.40	0.10^f
			0.20^s		0.02^s
Hygroscopic	very	no	slightly	somewhat	somewhat

$f =$ fast component, $s =$ slow component

per MeV of energy deposit. The detected signal is usually quoted in terms of photoelectrons per MeV produced by a given photodetector. The relationship between photons/MeV produced and p.e.'s/MeV detected involves factors for light collection efficiency (typically 10–50%, depending on geometry) and the quantum efficiency of the detector ($\sim$ 15–20% for photomultiplier tubes and $\sim$ 70% for silicon photodiodes for visible wavelengths). The quantum efficiency of the detector is usually highly wavelength dependent and should be matched to the particular crystal of interest to give the highest quantum yield at the wavelength corresponding to the peak of the scintillation emission. The comparison of the light output given in Table 12.2 is for a standard photomultiplier tube with a bialkali photocathode. For scintillators which emit in the UV, a detector with a quartz window should be used.

12.3. Čerenkov detectors

Čerenkov detectors utilize one or more of the properties of Čerenkov radiation discussed in the Passages of Particles through Matter section (Sec. 10 of this *Review*): the existence of a *threshold* for radiation; the dependence of the Čerenkov cone half-angle θ_c on the *velocity* of the particle; the dependence of the *number of emitted photons* on the particle's velocity. The presence of the refractive index n in the relations allows tuning these quantities for a particular experimental application (*e.g.*, using pressurized gas and/or various liquids as radiators).