Lutetium-Based Scintillators for a Tau-Charm Factory ECAL

J. Swain
Northeastern University, Boston, Mass.

March 1999, SLAC
Workshop on the τ-charm Factory

Lutetium-Based Scintillators

☛ **Cerium-doped lutetium oxyorthosilicate (LSO), lutetium orthophosphate (LOP), and lutetium aluminum perovskite (LuAP) compared to other popular scintillators.**

Scintillator	BGO	NaI(Tl)	LSO	LOP	LuAP
Relative Light Output	100	667	217	500	320
Decay Time Constant (ns)	300	230	24	40	11(28)
Density (g/cm^3)	7.13	3.67	6.53	7.4	8.34
Hygroscopic?	no	yes	no	no	no
Rugged?	yes	no	yes	yes	yes

Properties of LSO

- Fast and bright
- Still expensive $\sim$ \$50/cc going down to \$15 (or lower?)
- Lu is the 2^{nd} rarest rare-earth element (after thulium), but is about as abundant as iodine and more abundant than cadmium, mercury and bismuth combined!
- Big commercial market for PET scanners (CTI)
- 2.6% of isotope 176 : 300 counts/sec/cc β's peaking at 600-700 keV
- Has to be grown from melt at 2200 C
- No room light, else heat to 50 C or let sit overnight in the dark