THE STUDY OF INORGANIC SCINTILLATING MATERIALS

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Inorganic scintillating materials are widely used in detectors for diverse applications ranging from high energy physics to nuclear medicine. Better understanding of the various scintillation mechanisms has led to innovative new materials for both gamma-ray and neutron detection, and the concept of scintillator design and engineering has emerged, whereby materials are optimized according to the scintillation properties needed by specific applications. Although certain incremental improvements may still be achieved in each property the main challenge then becomes to find a scintillator material that has the correct combination of properties to match the needs of a given application rather than to find a scintillator with a single outstanding characteristic.

In this paper the procedure for measuring the temporal characteristics and light output of inorganic scintillating materials excited by β- , γ- , and α-particles from radioactive sources is described. Results of measurements of characteristics are presented for ~40 scintillating compounds including cerium-doped yttrium silicate and scandium borate; europium-doped strontium phosphate; cerium-doped strontium silicate, calcium silicate and magnesium calcium silicate; etc. Upon- and -excitation, cerium-doped scandium borate gives the highest light output with a fluorescent lifetime of 40 ± 4 ns. The highest light output for -excitation was from cerium-doped yttrium aluminum perovskite, with a fluorescent lifetime of 29 ± 3 ns.

Keywords: *Inorganic scintilliating materials, detector, gamma-ray, neutron detection.*