

Scintillation powders for neutron detection

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The work presents scintillation powders such as GdOBr:Ce, SrI₂:Eu, Dy, BaMgAl₁₀O₁₇:Eu, Mn, YAP:Ce, YAG:Ce and others for detection of neutrons of wide energy ranges in connection with suitable conversion isotope. The influence of fraction size was studied as well as the fraction size of conversion powder and choice of suitable mixture ratio. Special interest was devoted to the study of scintillation nanoparticles and nanoparticles for the use of neutron energy conversion. Several powders are commercially available, but not used as an object for neutron detection. The inaccessible powders were laboratory prepared by solid-state synthesis. The response for alpha, beta and gamma radiation was also performed. The results and properties of chosen scintillators were compared with zinc sulfide activated by silver in connection with lithium-6 fluoride. The scintillation powder was mixed with conversion isotope in an appropriate ratio and with a suitable optical binder. The mixture was then applied to the optical glass and coupled to photomultiplier. The binder selection is dependent on the physicochemical properties of the scintillator powder, 5% polyvinyl alcohol was used for water insoluble powders, transparent varnish and silicone fluid for water soluble powders. The shape of the output signal from the photomultiplier divider was generally studied in order to determine the possibility of pulses separation generated in the scintillator sensitive to alpha and gamma radiation. The study aims to take advantage of current knowledge in the field of scintillation materials synthesis and to find a fast scintillation material with properties similar to zinc sulfide activated with silver.

Has accepted

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