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Development of scintillator for a compact fast neutron imaging equipment at INPC of CAEP

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Fast-neutron imaging (FNR) is a nondestructive testing technology using fast neutrons as probes. The key problem of improving the quality of fast-neutron imaging is developing a suitable detector, which can convert the invisible fast-neutron image into a visible light image effectively and distinguishably.

The researchers in Institute of Nuclear Physics and Chemistry(INPC)of Chinese Academy of Engineering Physics(CAEP) are focusing on fast neutron imaging promotion and application. Now a transportable neutron imaging equipment has been installed based a compact accelerator neutron source using D-T reaction. In order to improve the quality of FNR, two kinds of fast neutron scintillators are developed at INPC. One is made of ZnS particles, resin and wavelength-shifting fibers(WSF), and the other is made of ZnS particles and polypropylene(PP). The appropriate parameters of the scintillators such as fibers arrangement, distance between fibers are optimized theoretically and the facture of the scintillators is also optimized.The scintillators are tested with14MeV neutrons at INPC and with fission neutrons at NECTAR, FRM II.The light output results show that all the scintillators are sensitive to 14MeV neutrons and fission neutrons. The imaging results also matched the calculations, shown that the sintillators resolution is better than 1mm.

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