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Development of actinide liquid scintillating target

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We present the development of a new kind of active actinide target, based on organic liquid scintillators containing the dissolved isotope that can be used for fission studies, but also for (n,xn) reactions measurements and potentially for radiative capture experiments. Amongst many advantages one can mention the very high detection efficiency, the Pulse Shape Discrimination capability, the fast response allowing high count rates and good time resolution and the ease of fabrication. The response of this target to fission fragments has been studied because the response of organic liquid scintillators to fission fragments is almost unknown. In the present work the response to fission events was also obtained with a ^{252}Cf source. Several kinds of scintillators were used. Especially it was shown that a scintillator based on Di Isopropyl Naphthalene (DIN) solvent with the PBBO scintillating molecule lead to a very good separation between fission and proton recoils. The light quenching against the actinide dissolved mass has been characterized. For uranium even if a strong quenching is observed, concentrations up to 10 mg/mL can be envisaged depending on the experiment to be performed and on the geometry of the active target. For thorium no quenching was observed. The discrimination of alpha, fission and proton recoil events is demonstrated. The alpha decay and fission detection efficiencies are simulated and compared to measurements. Finally the use of such a target in the context of fast neutron induced reactions is discussed.

Primary author: Dr AUPIAIS, Jean (CEA DAM DIF, France)

Co-authors: Mr VARIGNON, Cyril (CEA DAM DIF); Dr BÉLIER, Gilbert (CEA DAM DIF); Mr VAYRE, Sylvain (CEA DAM DIF)

Presenter: Dr AUPIAIS, Jean (CEA DAM DIF, France)

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