OFFRE DE STAGE POST-DOCTORAL – 12 months

MULANS : Multi-Layer Nano Scintillator

Elaboration d'un détecteur à scintillation par des procédés de dépôt multicouches

Context

In the world of radiation detection, scintillation has always attracted much attention because of its very versatile characteristics. For each concerned applications you can find an organic or inorganic scintillator that will fit the requirements of the desired measurements. However, for all scintillator two phenomena are an ongoing challenge to master. On one hand the scintillation light emission is isotropic which hinder efficient light collection, on the other hand ultra-fast decay-time cannot be achieve without drastic loss of light production.

We propose here a study to work for the first time on the materials choices for such a layered scintillator for the Purcell effect.

Objectives

The mission will consist in the stacking of multilayer device composed by the alternation of thin organic and inorganic layers. Each layer will be in the range of several tens of nanometers (max 100 nm) and the stack counts 10 to 20 layers (indeed 5 to 10 bilayers).

As a first challenge the achievement of devices well-controlled in term of thicknesses (for both layer deposited but also as the number of stack). The materials used for the layer will be evaluated in terms of efficiency and processability. A series of molecular structures are identified, but it might be reconsidered subsequently to the step #2. A set a device, so called Purcell cells will allow determining the best efficiency in a second step.

A second challenge will be testing the Purcell cell as scintillator. The anisotropic response of the scintillator will have to be characterized, for that the DRT Partner would investigate the angular response of the multi-layer scintillator with a goniometric platform add-on for their spectro-fluorimeter instruments.

Skills and Profile expected

We are seeking for a young researcher, recently graduated, having skills in thin films elaboration and ideally thermal evaporation under vacuum. A good affinity for device elaboration and characterization will be appreciate.

Place of the research

The French Alternative Energies and Atomic Energy Commission in the Campus Paris Saclay at the "CEA de Saclay"

Contacts:
Guillaume Bertrand, CEA de Saclay, 0169089148, guillaume.bertrand@cea.fr
Ludovic Tortech, CEA de Saclay, 0169086556, ludovic.tortech@cea.fr

July 2023