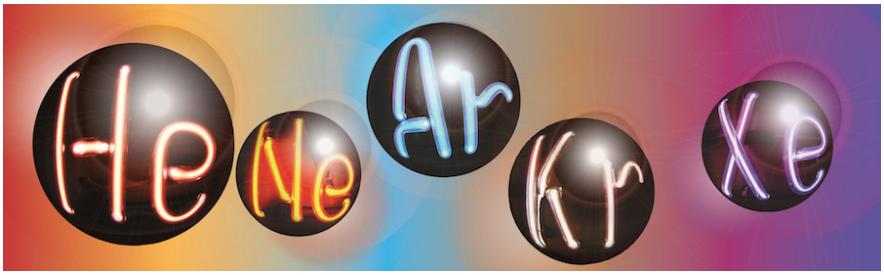

Contribution ID: **28** Type: **Presentation**

Fluorescence of optical materials down to 4 K – acrylic, TPB, pyrene

Thursday, 22 September 2022 10:00 (15 minutes)

Many noble liquid-based particle detectors contain the medium in an acrylic vessel. The acrylic may be coated by a wavelength shifter if the scintillation light produced from particle interactions with the medium is outside the wavelength range of the photodetectors. In the case of liquid argon, the 128 nm scintillation light must usually pass through a wavelength shifter to be detected by standard photodetectors which are more sensitive to visible wavelengths. We have investigated the temperature dependence of fluorescence properties for pyrene-polystyrene coatings which can be used as a wavelength shifter to complement 1,4,4-tetraphenyl-1,3-butadiene (TPB), a common wavelength shifter for noble liquid detectors. Pyrene has a much longer fluorescence time than TPB which could be useful for pathological background rejection in a detector. The fluorescence properties of pyrene-polystyrene coated acrylic were studied using samples with different concentrations and fluorescence grades of pyrene. In addition, we have studied the fluorescence of the acrylic itself, as it could form a background in rare-event searches and compared the relative light yield of acrylic to TPB at different temperatures. All these materials were excited with 285 nm UV light and studied at various temperatures between 4 K and 300 K to cover the operating temperatures of most particle detectors. We present the changes in the spectra and light yields of all these materials with temperature and discuss an additional analysis of the temperature dependence of the pyrene fluorescence time constants. These results are reported in recent publications (H. Benmansour et al 2021 JINST 16 P12029 & E. Ellingwood et al 2022 NIM-A 1039 167119) and we are currently working towards a similar fluorescence analysis of Clevios coated acrylic.

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