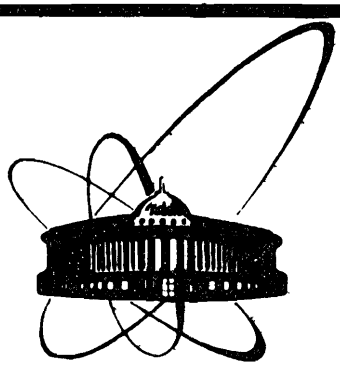

объединенный
институт
ядерных
исследований
дубна

E13-86-217

P.Kozma, Č.Hradečný

DIPHENYLSTILBENE AS A WAVELENGTH SHIFTER

Submitted to "Nuclear Instruments and Methods"

1986

The polarization of neutrons can be determined from the left-right azimuthal asymmetry measurement[1] in the scattering of neutrons by helium. The analyzing power of the elastic n-^{4}He scattering is high and varies smoothly with energy[2]. The recoiling ^{4}He nuclei can be detected by scintillations in gaseous or liquid helium. The neutron polarimeter consists of a target cell and detectors placed in symmetric left-right positions at a given scattering angle. It has been established that the use of a liquid-helium target (a liquid-helium target is several times more dense than a typical high-pressure gas target) greatly increase the detection efficiency of the polarimeter[3]. However, in a liquid-helium the wavelengths of scintillation photons lie in the ultraviolet region and must be shifted into a spectral region of the sensitivity of photomultiplier tubes[4]. Therefore, the inner walls of the target cell must be coated with a suitable wavelength shifter. It should be noted that the polarimeter efficiency depends also on the properties of the shifter being used.

We have experimentally investigated optical properties of various wavelength-shifter materials[5]. One of the most efficient having a short luminiscence time (about 10^{-9} s) was found to be the p-p' diphenylstilbene (DPS). Thin layers of DPS (of thickness about 0.2 mg/cm^2) were deposited on the inside of the glass cell by a standard method of vacuum evaporation. In addition, thin layers of DPS have also been prepared by dissolving of DPS in xylene; the mixture was heated to the boiling point of xylene 138.2° C and after complete dissolution of DPS was cooled down and poured onto glass slides.

Emission spectra of both DPS samples excited by ultraviolet radiation (see fig.1) were observed by a standard method of optical spectrography. Relative intensities were obtained from the density of spectral lines. The emission spectrum of a DPS evaporated on the inside of the glass cell is displayed in fig.2. As can be seen, the wavelengths of emission light lie in the range from 3800 to 4600 Å, which is compatibile with the maximum sensitivity of photomultiplier tubes conventionally used in scintillation spectroscopy.

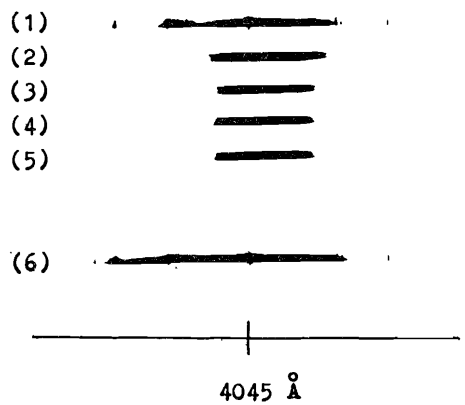

Fig.1. Emissions spectra of DPS layers vacuum-deposited on the inside of glass cell (strips 2 and 3) and evaporated on glass slides (strips 4 and 5) excited by ultraviolet radiation. Strips 1 and 6 are spectral lines of Hg.

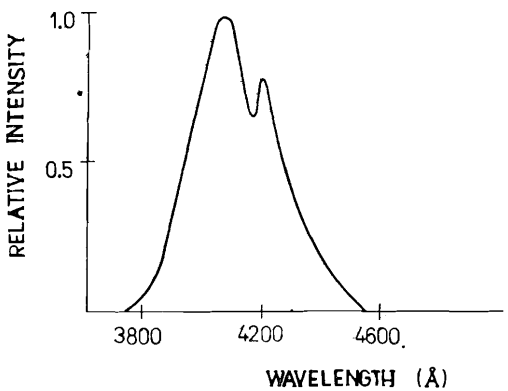

Fig.2. Emission spectrum of diphenylstilbene evaporated on glass.

Our conclusion is that thin p-p' diphenylstilbene layer vapour-deposited on the glass wall of the helium-liquid target cell of the neutron polarimeter can be used as a suitable wavelength shifter.

References

1. Sikkema C.P., Steendam S.P., Nucl.Phys., 1975, A 245, p.1.
2. Helaly A., Birchall J., Videla N., McKee J.S.C., Ramsay W.D., Nucl. Instr. and Meth., 1985, A 241, p.169.
3. York R.L., Hiebert J.C., Woolverton H.L., Northcliffe L.C., Phys. Rev., 1983, C 27, p.46.
4. Surko C.M., Packard R.E., Dick G.J., Reif F., Phys. Rev. Lett., 1970, 24, p.657.
5. Birks J.B., in: The Theory and Practice of Scintillation Counting, Oxford Press, Oxford, 1964.

Recieved by Publishing Department
on April 9, 1986.

Козма П., Градечны Ч.

E13-86-217

Дифенилстилбен как сместитель длин волн

Было показано, что тонкий слой дифенилстилбена, напыленного на стекле, является эффективным сместителем длин волн сцинтилляций Не в спектральную область чувствительности фотоумножителей.

Работа выполнена в Лаборатории высоких энергий ОИЯИ.

Препринт Объединенного института ядерных исследований. Дубна 1986

Kozma P., Hradečný Č.

E13-86-217

Diphenylstilbene as a Wavelength Shifter

Thin diphenylstilbene layers deposited on glass were shown to be an effective wavelength shifter of He-scintillations into a spectral region, where photomultiplier tubes are sensitive.

The investigation has been performed at the Laboratory of High Energies, JINR.

Preprint of the Joint Institute for Nuclear Research. Dubna 1986