PHYSICS

Photoluminescence of Irradiated Plastics

It is well known that plastics become coloured to various degrees by irradiation. The change in optical density at a suitable wavelength can be used for radiation dosimetry in the higher dose range. In clear plastics the ultra-violet absorption edge extends toward the longer wavelength, producing a yellowish brown discoloration.

We investigated the applicability of various types of polymethyl methacrylate (PMMA) to radiation dosimetry. We found that besides the discoloration induced by radiation (which has already been extensively investigated¹⁻³), the irradiated PMMA exhibits photoluminescence. Several types of PMMA were investigated with an analytical mercury lamp. Table 1 summarizes some characteristics of a few samples of photoluminescent PMMA.

Material	Colour of light emitted	Intensity of light emitted
'Piacryl P'	Yellowish	Strong
'Acrylac'	Yellowish	Medium
'Paraglas'	White	Weak
'Bexoid'	Blue	Very strong

Exact measurements were carried out with a spectro-photofluorimeter. Specimens were irradiated with light from a high pressure xenon lamp at wavelengths of 320 nm and 360 nm. The fluorescence spectra of irradiated 'Piacryl P' are shown in Fig. 1.

Fig. 1. ■, 320 nm; ●, 360 nm.

It is hoped that the photoluminescence of PMMA induced by radiation will provide information on the mechanisms of reactions induced in solid plastics by radiation. Further investigations are in progress to clarify the observed phenomenon.

We thank Prof. L. Kesztyös, director of the Pathophysiological Institute, Medical University, Debrecen, for permitting us to obtain the spectrophotofluorimetric measurements, and Dr. S. Damjanovics for his help during investigations.

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Fig. 1. Levitation melting and "splat" quenching apparatus. (Scale approx. $\frac{1}{2}$.)

pyrometer. This ability to monitor temperature continuously offers an obvious advantage over disappearing filament pyrometry.

One of the copper plates of the splat quencher is driven against the other by a large solenoid. A simple time delay is connected to the power generator on/off switch, so that switching off the current in the coil activates the time delay, which eventually triggers the solenoid which results in the molten metal drop being "splattered" between the two copper plates. The quench is started in less than 0.2 sec and quench rates of 10^6 – 10^8 °C/sec have been claimed for splat cooling⁶.

Slow cooling can be achieved by steadily increasing the helium/hydrogen flow rate. If this results in solidification, then the drop can be released into a liquid quenchant which replaces the splat cooler. Cooling to lower temperatures necessitates bringing up the refractory tipped rod to support the drop and decreasing the power input to the coil.

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