

Photoacoustic spectra of some laser dyes

R S RAM and OM PRAKASH

Division of Standards, National Physical Laboratory, New Delhi 110012, India

MS received 8 July 1987; revised 11 November 1987

Abstract. Photoacoustic spectra of rhodamine 110, rhodamine 6 G, rhodamine B, rhodamine 101 and coumarin 102 laser dyes have been recorded at room temperature of 25° C in the spectral range of 350–750 nm. These samples were taken in powder as well as in solution forms. For this purpose the closed and the open photoacoustic cells have been used. It is hoped the present study would be useful for characterization of these dyes.

Keywords. Photoacoustic spectroscopy; absorption spectrum; laser dyes.

PACS No. 78·40

1. Introduction

The continuous absorption and high rigidity of dye molecules make them suitable for use as an active medium (Schafer 1973) in dye lasers. In order to characterize the dyes, it is desirable to know their absorption features. Rohatgi and Singhal (1966) recorded the absorption spectra of rhodamine B in H₂O at 22° C. Solwyn and Steinfeld (1972) studied the aqueous solutions of rhodamine B and rhodamine 6 G. The absorption spectra of coumarin-102, rhodamine 110 and rhodamine 6 G were also reported by Drexhage (1972, 1973). As in the above cases, when absorption studies are conducted to characterize laser dyes by conventional techniques, they create difficulties due to excessive light scattering and/or opacity of the sample and considerable sample preparation problems. They are not therefore useful over a wide wavelength range. For this purpose one can employ the method of photoacoustic spectroscopy, (PAS) (Pao 1977; Rosencwaig 1980; Helander 1983) which is free from the above difficulties. Photoacoustic (PA) spectra of dye solutions of melachite green in ethanol and PA spectra of mixed solutions of melachite green and rhodamine 6 G were recorded and compared with their calculated PA spectra (Schneider and Moller 1983) and found to be in good agreement. The PA spectra of a few dye solutions were recorded by Helander (1983) using an open PA cell. The conventional absorption and PA spectra of a few dyes have also been compared earlier (Rosencwaig 1980). In the present study the photoacoustic spectroscopic technique has been used to record the spectra of rhodamine 110, rhodamine 6 G, rhodamine B, rhodamine 101 and coumarin 102 in powder as well as in solution form.