

## Photoacoustic spectra of $As_2S_3$ — $As_2Se_3$ glasses<sup>†</sup>

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**Abstract.** Photoacoustic spectra of As-S, As-Se glasses as well as the  $As_2(S,Se)_3$  glasses have been investigated. Photoacoustic spectra of powdered samples give results comparable to those obtained from transmission spectra, the latter studies requiring preparation of thin films. Temperature-dependent studies of the  $As_2S_3$  glass have been carried out. Optical behaviour of these glasses has been interpreted in terms of homoatomic bonding defects.

**Keywords.** Arsenic chalcogenide glasses; homoatomic bonding defects; optical absorption edge; photoacoustic spectroscopy.

### 1. Introduction

It has been recognized (Ganguly and Rao 1981) that photoacoustic spectroscopy (PAS) is a sensitive method for studying solids which are difficult to study by normal transmission or reflectance spectroscopic techniques. Arsenic chalcogenide glasses which exhibit absorption edges in the visible region (Tanaka 1976) possess high extinction coefficients and are highly reflecting and thin films of the material have to be taken for studying their optical behaviour. Arsenic sulphide,  $As_2S_3$  and arsenic selenide,  $As_2Se_3$  glasses also exhibit interesting photo-structural effects (Treacy *et al* 1980; De Neufville 1976). We therefore consider it instructive to investigate the PAS of  $As_2S_3$  and  $As_2Se_3$  glasses and extend the previous preliminary study of Ganguly and Rao (1981) to other systems. In view of the many investigations reported about these glasses by Mohan (1981), it should be possible to assess the viability of PAS as a useful investigative tool to study glasses. We show in this investigation that the absorption edges are indeed easily located and that many useful inferences about the behaviour of chalcogenide glasses may be drawn from PAS studies.

### 2. Experimental

$As_2S_3$ ,  $As_2Se_3$  and three different  $As_2(S,Se)_3$  glasses were prepared from 5N purity elements (Koch-light). Proper mixtures of the elements were melted in quartz ampoules sealed under low pressure of argon. The melts were agitated in a rotary furnace for over 8 hours at 1000° C and quenched in water. Powders of these glasses suitable for PAS studies were prepared by grinding the glass thus obtained.

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