INFRARED REFLECTANCE INVESTIGATION OF THE STRUCTURE OF $xSb_2S_3.(1-x)As_2S_3$ GLASSES

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1. Introduction

Chalcogenide glasses have attracted much attention over the years in light of their technological applications, including infrared transmitting optical elements, acousto-optic and memory switching devices, and materials useful for image creation and storage [1]. In addition, new chalcogenide glass compositions exhibit superionic conducting properties very promising for electrochemical applications [2].

As_2S_3 is the most extensively studied chalcogenide glass mainly because of its ease of formation, its excellent IR transmission and its resistance to atmospheric conditions and chemicals [3]. Even though As and Sb belong to the same group of the Periodic table, As_2S_3 and Sb_2S_3 do not display the same glass-forming tendency. Glassy Sb_2S_3 is very difficult to form because of the high cooling rates required [4]. However, addition of As_2S_3 to Sb_2S_3 enhances greatly the glass-forming ability of the latter, and thus, glasses in the mixed system Sb_2S_3-As_2S_3 can be formed.

It is generally accepted that the three dimensional network of glassy As_2S_3 is built of trigonal pyramidal units, AsS_3, which are interconnected through As-S-As bridges [5-7]. There is also evidence that the intermediate range order of this glass involves two neighboring pyramids and their shared S-atom, with the correlation length being ~ 7Å [8]. The rearrangement of such coupled pyramids with respect to the neighbors has been used to explain properties such as the reversible photoinduced structural changes [8]. Correspondingly, it has been shown that the basic structural units of glassy Sb_2S_3 are the trigonal pyramids SbS_3 bonded to each other by S atoms [4]. It is of interest to note that the resulting network of glassy Sb_2S_3 exhibits lower degree of local disorder around Sb atoms than that of crystalline Sb_2S_3 [9].

Despite the general agreement on the structure of glasses X_2S_3 (X=As, Sb), the structure of glassy materials in the mixed system Sb_2S_3-As_2S_3 remains controversial. Thus, some authors based on the results of various spectroscopic

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