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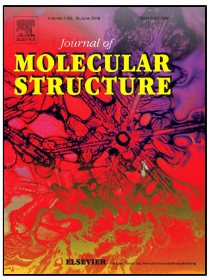

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ACCEPTED MANUSCRIPT

Structural studies of tellurite glasses doped with erbium ions

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Abstract

The materials under investigation were the tellurite glasses. Basic glasses and glasses doped with erbium Er^{3+} ions were examined. The positron lifetime measurement method PALS (Positron Annihilation Lifetime Spectroscopy) and the Raman spectroscopy were applied in order to analyse their structural properties. The proposed PALS method allows to identify structural defects in amorphous materials (glasses, ceramics and polymers) that are difficult to detect with the use of other traditional measuring methods. The conducted studies revealed two positron lifetime components τ_1 and τ_2. On the basis of the two-state model, positron capture parameters were calculated, which allowed to draw conclusions concerning the nature and degree of defects of the examined tellurite glasses. Application of the Raman spectroscopy resulted in assessment of the effect of Er^{3+} on the structure of the examined material.

Keywords

tellurite glasses, Raman spectroscopy, PALS, defects

1. Introduction

The glasses doped with erbium ions are attractive active materials for lasers generating radiation of the wavelength range $\lambda = (1{,}5 \div 1{,}6)$ μm, commonly called "safe for eyesight". The interest in lasers of this spectral range results from the unique propagation properties of the radiation in different environments allowing its application, i.e. in telecommunication, telemetry technology, medicine [1,2]. Rare earth ion doped tellurite glasses are characterized by wide emission bands, long lifetimes at excitation levels, thermal stability and low cost of production [3,4]. In the structure of tellurite glasses, areas of different degrees of ordering can be found forming coordinating polyhedrons creating glass framing and having their crystalline equivalents, as well as empty spaces (network), in which glass modifying ions can be

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