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# Investigation of the composition-structure-property relationship of $\text{As}_x\text{Te}_{100-x}$ films prepared by plasma deposition

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## Abstract:

$\text{As}_x\text{Te}_{100-x}$  amorphous films of different chemical content were prepared by Plasma-Enhanced Chemical Vapor Deposition (PECVD). For the first time the optical properties of As-Te chalcogenide materials have been measured in UV-VIS-IR ranges (from 0.2 to 25  $\mu\text{m}$ ) for a very wide range of chemical compositions (20-80 at.% As). As-Te films have been tuned from 0.80 to 1.10 eV. The IR results obtained have been juxtaposed with the Raman spectroscopy findings to establish the correlation between optical and structural properties of the materials developed. Reversible and irreversible changes in the phase composition of the As-Te films under annealing of the surface by laser irradiation have been demonstrated and studied. In order to determine the potential areas of application of the prepared As-Te films the thermal and photo sensitivity has been also investigated.

**Keywords:** As-Te chalcogenide films, optical properties, Raman spectroscopy, laser annealing

## 1. Introduction

The Te-based chalcogenide glasses are used as materials for IR fiber optics [1], fabrication of two and three-dimensional integrated optical elements [2, 3], and for production of phase-change memory devices [4]. They possess a wider transparency window in IR region and lower phonon energy values in comparison with sulfur- and selenium-based glasses [5] in combination with a relatively narrow bandgap. Among the whole family of Te-based materials the As-Te binary system is of particular interest due it serves as a model for understanding of the properties of the whole family of Te-based glasses [6].

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