E-beam structuration of Se-rich chalcogenides

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Amorphous chalcogenides based on selenium (Se) and tellurium (Te) are extensively studied due to their unique physical properties[1]. These materials find practical applications in infrared technologies, micro and nanoelectronics, nano-optics, photonics, and optoelectronics[2]. Phenomena induced by laser and electron beam irradiation in amorphous chalcogenides are actively investigated, as these processes can lead to surfacic mass transfer, and thus, allow controlled elaboration of surface structures[3]. The driving force for the formation of these structures is expected to be linked to charge accumulation in the irradiated regions[4].

In this work, electron beam structuring effect is investigated on Se-rich chalcogenide thin films. Three different alloys were studied: pure Se, $Se_{7.6}Te_{2.4}$, and $Se_{8.3}Cu_{1.7}$, aiming at better understanding the link between e-beam structuration and chalcogenide electrical conductivity (σ), considering that $\sigma_{Te} \sim 2 \times 10^6 \times \sigma_{Se}$ while $\sigma_{Cu} \sim 6 \times 10^{11} \times \sigma_{Se}$. Furthermore, e-beam structuration was studied on both amorphous and crystalline films, providing new insights into large-scale chalcogenide surface patterning technique potential.

Keywords:
Electron beam irradiation, Se-rich chalcogenides, thin films, surface structuration

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