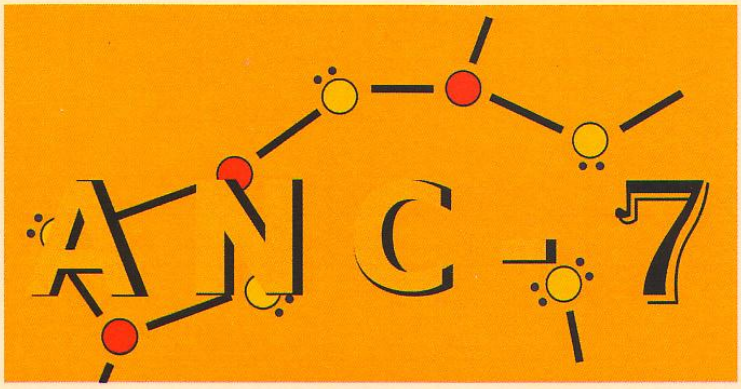

Abstract Book

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Inorganic resists for UV lithography

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During all the stages in development of opto- and microelectronics inorganic photoresists based on chalcogenide semiconductors attracted attention due to their high resolution, technological effectiveness in manufacturing layers with a minimal amount of defects and possibility to exposure by radiation with various wavelengths . The complex of properties, inherent to these resists, allowed using them for production of nano-dimensional elements with application of various methods, including those of interferential and plasmonic nano-lithography, laser and near-field optical recording [1-4]. Traditional use of chalcogenide films as a photoresist was based on irreversible photoinduced structural transformations that observed in the thermally deposited films.

To produce nano-dimensional structures, it is necessary to expose inorganic photoresists by radiation from the ultraviolet range. The widest range of spectral sensitivity in the UV range is observed in inorganic photoresists based on the systems As–S, As–S–Se, As–Ge–S.

One of limitations for broad application of inorganic photoresists based on chalcogenide semiconductors is availability of highly toxical tellurium and arsenic in a large number of these compositions. Application of the photoresists based on the system Ge–Se and $As_4Ge_{30}S_{66}$ seems to be more safety. Recently we reported that the reversible photostructural changes are accompanied by a change in the solubility of chalcogenide layers also (including Ge-based films), and negative amine-based etchant dissolve illuminated areas of this films, i.e. act as positive etchants [5].

In this work we report on the results of investigation of positive selective etching of annealed chalcogenide films and realization of photolithography on Ge-based chalcogenide layers by irradiation of the focused laser beam. The experiments performed by us showed the opportunity to obtain nano-dimensional elements with the height 100 to 140 nm when using the inorganic photoresist $GeSe_3$ and $As_4Ge_{30}S_{66}$ and the recording wavelength 405 nm. Further optimization of photoresist compositions based on the system Ge–Se can enable one to expand the spectral range of exposing radiation used in recording 3D structures.

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