INTERACTION OF CdTe, $Zn_xCd_{1-x}Te$ AND $Cd_{0.2}Hg_{0.8}Te$ WITH HNO_3–HI–$C_3H_6O_3$ IODINE EVOLVING ETCHING SOLUTIONS

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Semiconductor materials such as II-VI, especially cadmium telluride and solid solutions based on it are widely used for the manufacture of photodetectors that are sensitive in the infrared spectrum, radiation and X-ray radiation detectors, solar cells and other semiconductor devices and appliances. Therefore, the formation of high surface quality single-crystalline substrates of such semiconductor materials is of particular importance.

The kinetics of the physico-chemical interaction of CdTe and $Zn_xCd_{1-x}Te$ and $Cd_xHg_{1-x}Te$ solid solutions with iodine evolving aqueous solutions based on HNO_3–HI–lactic acid has been studied and the concentration limits of the etching compositions according to the quality of the semiconductor surface and the dissolution rate of the material have been developed and compositions of polishing solutions have been optimized.

For the experimental studies single crystal samples of *p*-type CdTe, $Cd_{0.2}Hg_{0.8}Te$, $Zn_{0.1}Cd_{0.9}Te$ and $Zn_{0.04}Cd_{0.96}Te$ plates with an area approximately 0.5 cm^2 and thickness of 1.5-2 mm have been used. For the preparation of the etchants the solutions of HNO_3 (70 %), HI (57 %) and lactic acid (80 %) were used. All reagents had the chemical grade. The study was conducted using the settings for chemical-dynamic polishing at T = 293 ± 0.5 K and speed of the disc rotation 80 min^{-1}.

Mixtures of HNO_3–HI–lactic acid have polishing properties at the etching of the CdTe and $Zn_xCd_{1-x}Te$ and $Cd_xHg_{1-x}Te$ solid solutions at the content of HNO_3 from 5 to 25 vol.%/ The rate of mentioned above semiconductors dissolution in the studied etchant varies from 2 to 14 mm/min. It was found that increasing of the zinc content in the solid solution leads to improving the quality of the semiconductor surface, and the best polished semiconductor is $Cd_{0.2}Hg_{0.8}Te$. From the kinetic dependences it was found that in all polishing iodine evolving solutions the dissolution occurs according to the diffusion mechanism as apparent activation energy, calculated from the temperature dependences, does not exceed 20 kJ/mol.

Polishing of CdTe and $Zn_xCd_{1-x}Te$ and $Cd_{0.2}Hg_{0.8}Te$ can be carried out with the solutions of composition (in vol. %) (5-25) HNO_3 : (40-95) HI : (0-55) $C_3H_6O_3$ with the polishing rate of 3-14 mm/min. After processing the samples must be washed in a 0.5 M solution of sodium thiosulfate and a large quantity of distilled water.