Method of nanosized relief formation on the CdTe single crystals surface by bromine-emerging etchants

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Developed by us method of nanosized relief formation on the CdTe surface consists of the following steps: grinding of the plates by abrasive powders (3-5 min) → mechanical polishing with diamond paste (3-5 min) → chemical etching to remove the damaged layer (80-100 μm) → finishing chemical-mechanical polishing (CMP) by new slow etchants.

The investigation was carried out on the single crystals of CdTe which have been grown by Bridgmans method. The etching mixtures were prepared using 40 % HBr, 10.9 % aqueous solution of $K_2Cr_2O_7$, ethylene glycol (EG) and glycerol (GL). A certain amount of viscosity modifier – GL was added to the bromine-emerging polishing solution **(B)** (vol. %): 35 $K_2Cr_2O_7$ – 50 HBr – 15 EG for obtaining low rate of CMP with support a polishing effect. Solution **B** is characterized by low rates of chemical-dynamic polishing and high polishing properties. It was established that it is possible to change the rate of CMP within the range 19.3-1.2 μm/min with increasing GL content from 0 to 80 vol. % in **B**. The process of CMP was carried out on a glass polisher covered with a batiste cloth for 2-3 min and a pressure on the sample in 2-3 kPa. Etchant were dropped by a drip method at a rate of 2-3 ml/min at T = 293 K.

The morphology of the polished surface has been investigate by atomic force microscopy using a scanning probe microscope NanoScope IIIa Dimension 3000TM (Digital Instruments, USA) and surface compositions was established using a scanning electron microscope ZEISS EVO 50XVP with a resolution of 2 nm. It is established that the CMP using the developed etchants contributes to the formation of a super-smooth ($R_a \leq 10$ nm), the stoichiometric surface of CdTe.

Elementary composition and roughness of CdTe single crystals surface after CMP: **etchant composition**, vol. % – 50 B : 50 Gl; **roughness of surface (R_a)**, nm – 0.59; **concentrations of elements**, at. % – 50.95 Cd, 49.05 Te, carbon, oxygen, bromine, and chromium are absent.