

Effect of Chemical Treatment on Electrophysical Characteristics of In/*p*-PbTe/In Structures

Malanych G.P., Tomashyk V.M.

V.Ye. Lashkaryov Institute of Semiconductor Physics, National Academy of Sciences of Ukraine, Kyiv, Ukraine
galya.malanich@gmail.com

Lead telluride is used for the manufacture of injection lasers in the 3-5 μm spectrum, as well as in thermoelectricity. The efficiency of devices based on lead telluride largely depends on the quality of electrical contacts.

In our experiments, the Bridgman-grown no crystallographic oriented single crystals of PbTe have been used. The PbTe characteristics – *p*-type, $[p] = 1.5 \times 10^{18} \text{ cm}^{-3}$, $\mu_p = 650 \text{ cm}^2/(\text{V}\cdot\text{s})$, undoped. Technological scheme of PbTe plates processing with etching composition $\text{H}_2\text{O}_2 + \text{HBr} + \text{EG}$ is given in [1]. Contacts have been formed on chemically etched surface of *p*-PbTe single crystals by the thermal vacuum deposition method. Pre-deposition surface treatment produced interfaces free from oxide layers. All measurements of the *I*–*V* characteristics were carried out by the *dc* method in the temperature range 77–295 K on PbTe samples after cutting, chemical-mechanical polishing (CMP) and chemical-dynamic polishing (CDP).

Measurements the *I*–*V* characteristics of In/*p*-PbTe/In structures were performed at temperatures of 77 K and 292 K. It should be noted the linearity of the corresponding *I*–*V* characteristics at 292 K. From Fig. 1, it can be seen that at low temperatures, the *I*–*V* characteristic deviates from linearity.

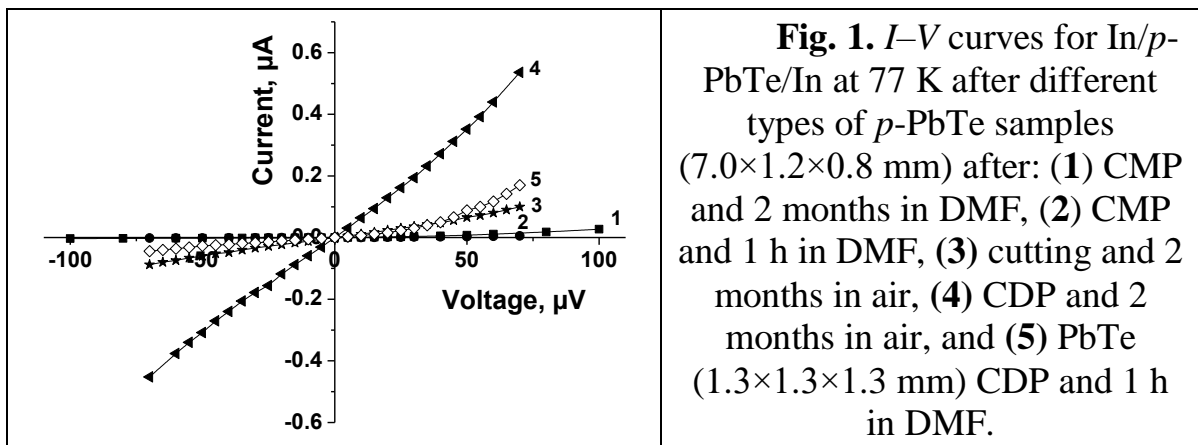


Fig. 1. *I*–*V* curves for In/*p*-PbTe/In at 77 K after different types of *p*-PbTe samples ($7.0 \times 1.2 \times 0.8 \text{ mm}$) after: (1) CMP and 2 months in DMF, (2) CMP and 1 h in DMF, (3) cutting and 2 months in air, (4) CDP and 2 months in air, and (5) PbTe ($1.3 \times 1.3 \times 1.3 \text{ mm}$) CDP and 1 h in DMF.

[1]. Malanych G.P., Stanetska A.S., Stratiychuk I.B., Tomashyk V.M. Technological scheme of mechanical and chemical treatment of PbTe and $\text{Pb}_{1-x}\text{Sn}_x\text{Te}$ solid solutions for obtaining polished surface of single crystal. *Materials Today: Proceedings*. 2021. V. 35, Part 3. P. 558-562.