CPPP 15 P MECHANICAL PROPERTIES OF TERNARY Yb COMPOUND $YbZn_2Sb_2$

D. Grabco, A. Nateprov, C. Pyrtsac, Z. Danitsa

Institute of Applied Physics, Academy of Sciences of Moldova
e-mail: grabco@phys.asm.md

The ternary Yb compound $YbZn_2Sb_2$ belongs to the typical diamagnetic semimetal. Its electrical and magnetic properties are studied in series of papers [1-3]. However the mechanical characteristics of this compound remain undefined. To this end, the objective of this work was to examine the microstructure and the main mechanical properties of the $YbZn_2Sb_2$ compound. The researches were carried out on the (0001) plane. As was shown in [4], the ternary $YbZn_2Sb_2$ compound adopts the trigonal-type structure. In accordance with this, in our work the crystallographic oriented growth steps have been revealed on the studied surface. They were oriented lengthwise the $<1\bar{1}00>$ directions and form between them the angles of 60 or 120 degrees (Fig.1).

The quasi-static (H_V) and dynamic (H_B) methods were used for the mechanical parameter testing. It was found that crystals were possessed of a middle hardness value: H_V=3.15 *GPa* and H_B=3.50 *GPa*. The Young modulus (E) was equal to 50,0 *GPa*. The hardness anisotropy on the (0001) plane was determined by use the microsclerometric method. The maximal ($H_{s,max}$) and minimal ($H_{s,min}$) sclerometric hardness was found to be, respectively, 1,28 GPa and 1,09 GPa, and as a result, the hardness anisotropy coefficient $k=(H_{s,max}-H_{s,min})/H_{s,min}$ to be equal to 17,5%.

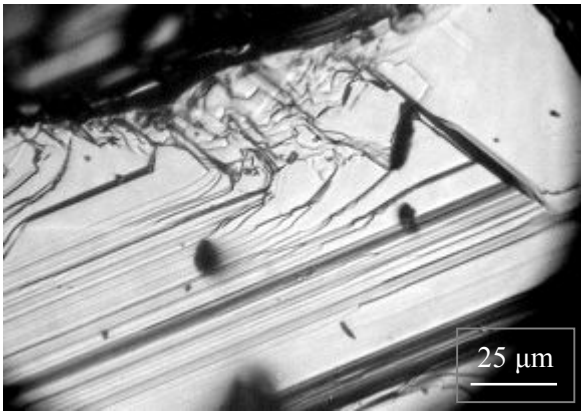

Fig.1. Light microscopy. The surface microstructure of the ternary $YbZn_2Sb_2$ compound on the (0001) plane

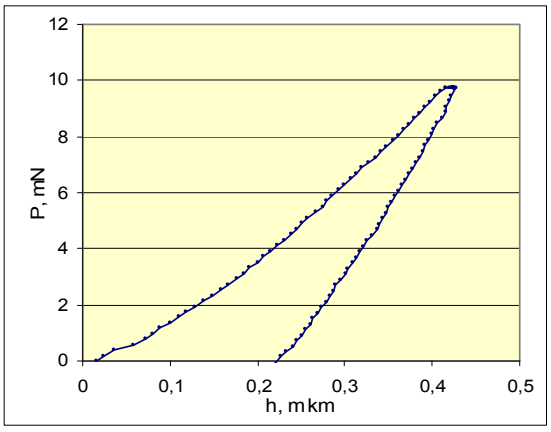

Fig.2. The load/displacement curve for the ternary $YbZn_2Sb_2$ compound obtained with a Berkovich indenter

The examination of the curves of dynamic loading/unloading showed that crystals were possessed of the appreciable elastic recovery (Fig. 2). The curve load/displacement indicates the smooth plastic deformation with the barely perceptible pop-in and pop-out effects. At the same time around the indentations and scratches the fine cracks were detected. Thereby the ternary $YbZn_2Sb_2$ compound due to its crystallographic structure manifests the both plastic and brittle properties and the not great anisotropy of hardness.

References

[1] C. Pfleiderer, R. Vollmer, M. Uhlarz, A. Faißt, H. v. Löhneysen and A. Nateprov // Physica B: Condensed Matter, vol. 312-313, 2002, pp. 352-353
[2] T.J. Zhy, C. Yu, J. He, S.N. Zhang, and Terry M. Tritt // Journ. of Electronic Materials, DOI: 10.2007 / s11654-009-0667-9, 2009, TMS
[3] E.I. Gladyshevskii, P.I. Kripyakevich, O.I.Bodak, *Ukr. Fiz. Zh.* 12 (1967) 447–452
[4] O.Ya. Zelinska, A.V. Tkachuk, A.P. Grosvenor, A. Mar // Chem. Met. Alloys, v. 1, 2008, pp. 204-209