NNN 7 P **MAGNETIZATION ANOMALIES IN SUPERCONDUCTING INTERFACES OF BICRYSTALS AND TRICRYSTALS OF Bi1-*x* - Sb*x* ALLOYS.**

F M Muntyanu [1, 2], A Gilewski [2], K Nenkov [2], A J Zaleski [2] and V Chistol [1]

[1] *Institute of Electronic Engineering and Industrial Technologies, Academy of Sciences of Moldova, Chisinau, 2028, Moldova*

[2] *International Laboratory of High Magnetic Fields and Low Temperatures, Wroclaw, 53421, Poland*

We have studied the magnetic properties of the bicrystals and tricrystals of Bi_{1-x} - Sb_x ($x \leq 0.2$) alloys in the temperature range (1.8 - 100) K and magnetic fields up 20 kOe. It is using the superconducting quantum interference device magnetometer (Quantum Design SQUID magnetometer) and the Physical Property Measurement System (Quantum Design).

In spite of anomalous diamagnetism of single crystalline samples, at low temperatures ($T < 30$ K) in crystallite interfaces (CI) of bi- and tricrystals, two kinds of dependences $m(T)$ are revealed - diamagnetic and paramagnetic. The estimations of carrier density $N_{para\,(dia)}$ from the Hall effect and Shubnikov-de Haas oscillations show that N_{para} in the paramagnetic bicrystal interfaces is almost 1.5-2 times higher than N_{dia} in the diamagnetic CI. Therefore, the main reason of strengthening of paramagnetism is higher carrier concentration.

The presence of one (mainly at large crystallite disorientation angle interfaces) or two superconducting transitions on diamagnetic CI are observed. On the other hand, $m(T)$ has positive values in tricrystals and in some bicrystals, and the paramagnetism sharply decreases at low temperatures ($T < 5$ K). In individual cases, the $m(T)$ transition from positive to negative values takes place too. The decrease of $m(T)$ at $T < 5$ K in magnetic fields $H > 5$ kOe is suppressed and samples exhibit diamagnetism in large temperature range. Such a behavior of $m(T)$ is indicative of the presence of superconductivity in one of CI layers against an appreciable paramagnetic background.

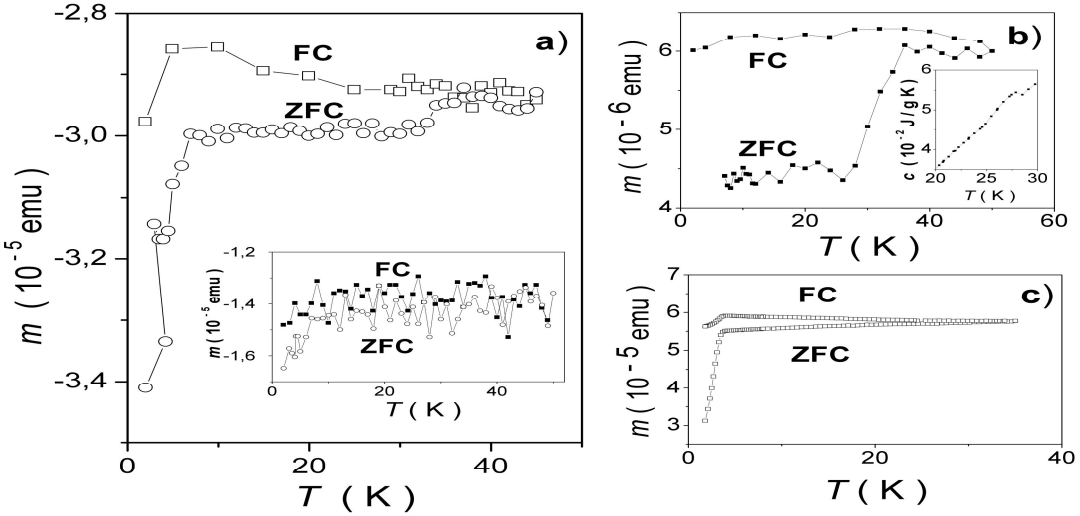

Fig.1. ZFC and FC dependencies in bicrystals and tricrystals of Bi_{1-x} - Sb_x alloys.

Figure 1 shows ZFC and FC temperature dependencies of magnetic moment of bicrystals and tricrystals of Bi1-x - Sbx ($x \leq 0.2$) alloys. As seen from this figure, ZFC and FC magnetic moment curves in the low magnetic field (H = 50 Oe) branch in all investigated samples at branching temperatures Tb ~ 36 K. Usually, the branching point of ZFC and FC curves for superconductors determines the transition temperature Tc. Therefore, in these bicrystals the temperature of the superconducting transition onset can achieve a value of 36 K, being the highest for the group-VB semimetals and their alloys. In the same temperature range, the specific heat has a well-expressed jump [see Figure1 (b), inset], indicating the second-order phase transition, which also confirms the superconductivity.