1st Scientific Conference PUT STEM Day 2025
stemday.put.poznan.pl

Study of fabrication of InSb thin films on GaAs substrate in potential application for IoT

P. Kałuziak[1], J. Raczyński[1], S. El-Ahmar[1], W. Koczorowski[1],

[1] Faculty of Materials Engineering and Technical Physics, Institute of Physics, Poznan University of Technology, Piotrowo 3, 61-138 Poznan, Poland
e-mail: piotr.kaluziak@doctorate.put.poznan.pl

Indium antimonide (InSb) has been extensively investigated for many years, renowned for its low energy gap of approximately 0.18 eV at room temperature, along with its outstanding mobility of electric charge carriers, recorded at 77000 $cm^2/(V \cdot s)$ [1]. The advancement of device fabrication techniques creates new opportunities for thin layers of InSb. Implementing the lithography process followed by metal deposition in vacuum conditions onto the graphene layer enables the creation of complex planar structures with distinctive functionality [2]. A minor adjustment to this structuring method makes it feasible to adapt the technology to thicker layers, such as InSb.

High-quality InSb thin films are produced using the Flash Evaporation Method (FEM) under high vacuum conditions on a gallium arsenide (GaAs) substrate. After a modified structuring approach, Hall and TLM structures were created to assess the galvanometric properties of the InSb-based hybrid structures. Furthermore, a structure was proposed to evaluate the effectiveness of the strip magneto sensor (SMS) in the InSb material [3]. Due to the high mobility of the charge carriers in InSb, it is expected that a notable magnetoresistive effect will be observed in specific geometric configurations, which enhances the potential for developing a magnetoresistive sensor that could be an integral component of the Internet of Things (IoT) [4].

The research presented has received funding from the National Centre for Research and Development No. LIDER/8/0021/L-11/19/NCBR/2020 and partly from the Ministry of Education and Science (Poland) under Projects No. 0512/SBAD/2420 and 0512/SBAD/6217.

References

[1] P. Lekwongderm, et al. Journal of Crystal Growth, **512** (2019) 198
[2] W. Koczorowski et al. Materials Science in Semiconductor Processing, **67** (2017) 92
[3] S. El-Ahmar et al., Applied Physics Letters, **110** (2017) 043503
[4] A. Shamsoshoar et al., Computer Networks, **183** (2020) 107593