## Comparative Study of the Molecular Beam Epitaxial Growth of InAs/GaSb Superlattices on GaAs and GaSb Substrates

## D. Benyahia<sup>1</sup>, Ł. Kubiszyn<sup>2</sup>, K. Michalczewski<sup>1</sup>, A. Kębłowski<sup>2</sup>, P. Martyniuk<sup>1</sup>, J. Piotrowski<sup>2</sup> and A. Rogalski<sup>1</sup>

 <sup>1</sup> Institute of Applied Physics, Military University of Technology, 2 Kaliskiego Str., 00-908 Warsaw, Poland
<sup>2</sup> Vigo System S.A., 129/133 Poznańska Str., 05-850 Ożarów Mazowiecki, Poland

Having been proposed by Sai-Halasz, Tsu and Esaki in 1977 [1], type-II InAs/GaSb superlattices have turned into a favorable material system for the infrared detector technology. This is due to its viable options, such as: the opportunity to tune the bandgap over a wide range of detection regions (3-30 µm), high absorption coefficient, reduced Auger recombination mechanisms, and reduced tunneling current. Traditionally, high quality InAs/GaSb superlattices have been grown on GaSb substrate. However, this latter has several shortcomings: high absorption coefficient, available only in small sizes, and expensive. Therefore, the growth on another substrate which overcomes these issues is a necessity. GaAs substrate seems to be a good alternative due to its low cost, availability in large diameters, and lower absorption coefficient. In the present work, we investigate the growth of short period (25 periods) InAs/GaSb superlattices on GaAs (001) substrate with 2° offcut towards <110> and on GaSb (001) substrate, by a solid-source molecular beam epitaxy system. The thickness was 10 ML for each constituent of the superlattice. Nomarski Microscopy revealed a good surface quality, with a root main square of surface roughness of 7 nm. High Resolution X-Ray diffraction characterization demonstrated that the superlattices grown on GaAs substrate exhibit almost the same crystalline quality as that grown on GaSb layers. The full width at half maximum (FWHM) of the zeroth-order peak is found to be as low as 190 arcsec for the samples grown on GaAs substrate, and 156 arcsec for that grown on GaSb substrate. This is achieved by the utilization of GaSb buffer layer grown on GaAs substrate, in order to reduce the large lattice mismatch of 7.8% between GaAs substrate and InAs/GaSb superlattices.

## Acknowledgment:

We acknowledge the support by The Polish Science Centre – grant no.2015/17/B/ST5/01753.



**Fig. 1**:004 high resolution x-ray diffraction curve in  $2\theta$ - $\omega$  direction of InAs/GaSb superlattices grown on GaSb (001) substrate (a) and on GaAs (001) substrate (b).

[1] G. A, Sai-Halasz, R. Tsu, and L. Esaki, Appl. Phys. Lett. 30, 651 (1977).