ALLOS Semiconductors

ICNS 2017: ALLOS explains why carbon-doping is not needed to achieve high isolation in GaN-on-Si

Strasbourg, France – 28th July 2017 – At this week's ICNS scientific conference ALLOS' co-founder and CTO Dr. Atsushi Nishikawa discussed three common believes about GaN-on-Si: Firstly, that the usage of carbon would be inevitable, secondly that using interlayers in the buffer would be a source of leakage and thirdly that the choice of the right reactor hardware would be decisive to achieve good results. With the experimental evidence presented Dr. Nishikawa is challenging the validity of these three widespread believes.

The first common believe Dr. Nishikawa is questioning is that the usage of intentional carbon doping would be inevitable. Developers of GaN-on-Si epiwafers are suffering from the fact that crystal impurities from the growth process cause the isolation of GaN to be far below its theoretically possible values. To overcome these insufficiencies makers of GaN-on-Si epiwafers usually apply carbon doping to achieve the required isolation. Unfortunately, conventional methods of carbon and other doping have negative side-effects. In contrast ALLOS' results prove that by focusing on superior crystal quality and thick GaN layers the required low leakage currents can be accomplish without any intentional carbon or other doping. This not only avoids negative side-effects of doping but also widens the process window for further optimization of numerous manufacturing and electrical properties.

A second common believe among many GaN-on-Si professionals is that interlayers would be a source of leakage. Dr. Nishikawa shows experimental evidence that the opposite is true: Carefully controlled interlayer growth conditions and positioning of the interlayers can improve isolation by more than one order of magnitude.

In combination, these techniques allow ALLOS to achieve a very low vertical and lateral leakage current of only 0.07 µA/mm^2 and 0.005 µA/mm respectively at 600 V. This is based on 7 µm thick GaN with very high crystal quality of 316 arcsec for (002) and 413 arcsec for (002) XRD. ALLOS' technology is available on both 150 mm and 200 mm epiwafer diameter, with SEMI-standard thicknesses. It is designed for manufacturability, is suitable for standard silicon lines, has a controlled minimum bow and no cracks.

In the closing part of his presentation Dr. Nishikawa addresses a third common believe about GaN-on-Si growth: That the choice of the right reactor hardware would be decisive. Of course, good hardware matters, but is by far not the dominant factor. ALLOS can apply its structure and growth methods on several hardware platforms as a comparison of results from two leading multi-wafer MOCVD reactor models demonstrates. On both reactors, similar material and electrical properties have been achieved.

For further information about ALLOS technology, licensing options and for your personal copy of the ICNS presentation titled *"Low vertical leakage current of 0.07 μm/mm^2 at 600 V without intentional doping for 7 μm-thick GaN-on-Si*" please contact:

ALLOS Semiconductors GmbH
Alexander Loesing
Breitscheidstrasse 78, 01237 Dresden, Germany
Phone: +49-351-212 937-20
Email: alexander.loesing@allos-semiconductors.com
www.allos-semiconductors.com