HVPE growth of GaN-towards free standing

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Despite the significant improvement of the growth of nitrides, they still suffer from a high defect density. Most of the structural defects in GaN layers originate from the heteroepitaxial growth on foreign substrates. The request for GaN substrates for homoepitaxy has still not been satisfied due to the difficulties to produce large-volume single crystals.

An alternative approach is the growth of quasi-bulk GaN layers by Hydride Vapor Phase Epitaxy (HVPE) which provides low cost high quality materials combined with a high growth rates capabilities.

A high quality thick HVPE GaN layer may be used either as a template, because of the widely used sapphire substrate, or as a free standing quasi-substrate for device structures elaboration. The latter application has attracted significant attention because it offers a way to overcome the lack of a native substrate which constitute the major problem in the GaN technology.

Several routes are foreseen for the production of free-standing high quality GaN :
-very thick HVPE layer followed by the removal of the substrate;
-thick GaN layer on a chemical removal substrate;
-HVPE ELO GaN thickening HVPE, removal of the substrate.

The first part of this talk will concern the HVPE growth of GaN. The principle and the use of HVPE will be described in details and the problems associated with the growth of GaN will be presented. A theoretical approach of the physical phenomena which occur during the growth will be developed.

In the second part the ways to obtain quasi-substrate or free-standing GaN will be discussed.