TAIYO NIPPON SANSO
The Gas Professionals

October 9, 2013

# Conclusion of a Joint Research Contract with the Nagoya Institute of Technology

Taiyo Nippon Sanso Corporation (TNSC) has concluded a joint research contract with the Nagoya Institute of Technology on October 1, 2013 for "Research into crystal growth technique to fabricate gallium nitride (GaN) film on large diameter silicon (Si) substrates and technologies for device evaluation."
This joint research will be carried out using the Metal Organic Chemical Vapor Deposition (MOCVD) equipment TNSC delivered to the Innovation Center for Multi-Business Nitride Semiconductors at the Nagoya Institute of Technology.

## 1. The Innovation Center for Multi-Business Nitride Semiconductors at the Nagoya Institute of Technology

The Innovation Center for Multi-Business of Nitride Semiconductors was launched and a lavish opening ceremony was held on September 1st and 20th respectively. The Innovation Center is a base for promoting research and development aimed at the application and commercialization of nitride semiconductor power devices. At the core of these devices is the "crystal growth technique to fabricate GaN film on Si substrate" which was developed by Professor Takashi Egawa and his collaborators at the Nagoya Institute of Technology, the leader in the field of GaN-based electronic device research.

In the Innovation Center, industry, academia, and government collaborate to promote research and development projects with an "under one roof" format. Many domestic companies involved in equipment, materials, and devices, etc. are participating in the Innovation Center, and TNSC is responsible for the evaluation of vapor deposition process properties using MOCVD equipment.

[Innovation Center for Multi-Business Nitride Semiconductors]
Address: Gokiso-cho, Showa-ku, Nagoya, Aichi, 466-8555 Japan
Participating organizations: 12 operations including Taiyo Nippon Sanso Corporation, and one public research institution

2. Overview of the joint research

• The Nagoya Institute of Technology and TNSC have been engaged in joint research into technologies for crystal growth technique to fabricate GaN film on Si substrate since 2011.

• In the previous joint research we mainly worked with Si substrates in four-inch and six-inch sizes but due to the opportunity provided by the founding of the Innovation Center we will be able to expand our research by focusing on mass production using eight-inch substrates.

• Using the equipment owned by the Innovation Center, the only equipment in the world which can handle test production of eight-inch GaN electronic devices (including post-processing), makes pilot production and verification of devices possible.

3. The plan of TNSC going forward

Through this joint research and the projects at the Innovation Center, we will accumulate data related to mass-produced MOCVD equipment, and aim to expand the market for MOCVD equipment, adding power device manufacturing applications to the conventional LED manufacturing applications, by gathering market information and deepening our relationships with the participating companies.

The MOCVD equipment made by TNSC (and installed in the Innovation Center) used in the joint research with world's largest processing capacity (yield rate of six eight-inch substrates)