

## **Dust formation around the cracks (black-bodies) in GaN single crystals**

*Parvaneh Ravadgar (Department of Photonics and Advanced Optoelectronic Technology Center, National Cheng Kung University, Tainan 701, Taiwan) and Ray Hua Horng (Graduate Institute of Precision Engineering, National Chung Hsing University, Taichung 402, Taiwan)*

The similarity between sonoluminescence (SL) spectra and vacuum states was already studied. Some researchers also attributed the SL spectra to black-body radiation. Recently, the origin of broad peaks in cathodoluminescence (CL) spectra of single crystals is attributed to cracks. This study tries to introduce cracks (vacuum states) in single crystals as black-bodies. For this purpose, pure effect of cracks on CL spectra of gallium nitride (GaN) single crystals was investigated.

Dislocation coupling during the single crystal growth at a constant temperature decreases the entropy of the system which increases stress-strain field. The stress-strain field gets released in the form of cracks. Along with cracks, external point defects (attributed to the main origin of dust grains) as the other sources of entropy also take parts to enhance total energy of the single crystals, which must be considered carefully. Different morphologies of dust grains aggregated around the cracks were observed.

A field-emission scanning electron microscope (FE-SEM) was used to check the morphology of dust grains. The detection source in the FE-SEM is based on the electron beam. One of the advantage of electron beam to other sources of detection is the charge of electrons which may distinguish the charged accumulation in the dust. It also may distinguish charged dust from the same uncharged dust.