

April 2, 2002

Japanese Government Agency Awards Nakamura Multi-Million Dollar Grant

Funding Backs Research to Make Novel Semiconductor In More Commercially Viable Ingot Form

Santa Barbara, Calif.--Shuji Nakamura, professor of materials and director of the Center for Solid State Lighting and Displays at the University of California at Santa Barbara (UCSB) has been awarded an ERATO grant by the Japan Science and Technology Corp. (JST). The Japanese government grant of 1.7 billion yen over five years amounts to approximately \$16 million according to the average rate of exchange computed by the awarding agency.

The ERATO (Exploratory Research for Advanced Technology) program dates to 1981. Nakamura is the second Japanese residing in the United States to receive the award. The other recipient Yoshihisa Yamamoto of Stanford University was awarded an ERATO in 1993.

Said Nakamura, "The ERATO award is less like the standard research grant than it is like a gift. The specifics of how I use this grant are up to me. I can determine everything myself. I am like the president of this project. The ERATO grant is a wonderful, creative way of supporting research. I am deeply honored that JST has selected me as the focus for their generous and visionary support."

Nakamura is using the ERATO support to figure out how to make a bulk crystal or ingot of the compound semiconducting material, gallium nitride (GaN). So far, the material has been made only in the form of thin films. The bulk crystal form is the key to widespread commercial use of gallium nitride in such devices as lasers and transistors.

Gallium nitride is the compound semiconductor that enables the production of the highest frequency of light--green, blue and ultraviolet. That high frequency or short wavelength is so important because the higher the frequency and the shorter the wavelength, the greater the amount of information that can be stored on a CD or DVD.

Already, this past February, nine manufacturers who pioneered DVD technology in the last decade announced agreement on standards for a new recordable optical disc format with a six-fold increase over current DVD storage capacity. That new standard is based on Nakamura's blue laser technology. According to the on-line newsletter Medialine, "The 'Blu-ray Disc' enables the recording, rewriting and play back of up to 27GB of data on a single-sided, single-layer 12cm disc using a 405nm blue-violet laser (in comparison, DVD-Video uses a 650nm red laser)."

The companies that established the basic specifications for the Blu-ray Disc are Hitachi Ltd., LG Electronics Inc., Matsushita Electric Industrial Co. Ltd., Pioneer Corp., Royal Philips Electronics, Samsung Electronics Co. Ltd., Sharp Corp., Sony Corp. and Thomson Multimedia. Commercial products using blu-ray technology could

be available as early as next year, but more probably the year after.

Nakamura's efforts, backed by the ERATO grant, to develop the more robust and therefore more commercially viable form of the compound semiconductor, are focusing initially on making a special high-pressure, high-temperature vessel for gallium nitride bulk-crystal fabrication.

The intellectual focus of the research, according to Nakamura, is on exploring the nature of inhomogeneity in nitride crystals. Inhomogeneity refers to defects in the structure of a crystal. Defects can be caused by impurities, compositional modulation, stress, or undulation. The idea is to find mechanisms that enable the tuning of energy levels in crystals affected by inhomogeneity.

The one requirement of the ERATO grant for the UCSB research team headed by Nakamura is partnership with researchers in Japan. Nakamura says that he has chosen two of the best gallium nitride research facilities as partners: one at Japan Tokyo Science University and the other at Tsukuba University.

Nakamura is a participant in the California NanoSystems Institute (CNSI), a joint collaboration between the Santa Barbara and Los Angeles campuses of the University of California, and one of the California Institutes for Science and Innovation initiated by Gov. Gray David to seed the State's high tech future.

Images



Media Contact

Tony Raidren
trairden@engineering.ucsb.edu
805.893.4301
