**Highly Efficient and Stable Red Phosphorescent Organic Light-Emitting Diodes Using Platinum Complexes**

Hirohiko Fukagawa, Takahisa Shimizu, Hiromu Hanashima*, Yoshichika Osada, Mitsunori Suzuki, Hideo Fujikake
*Tokyo University of Science

We demonstrate highly efficient and stable red phosphorescent organic light-emitting diodes (OLEDs) using platinum complexes. The host/dopant combination was found to be a crucial factor in obtaining high efficiency and stability in the phosphorescent OLEDs using platinum complexes. The OLEDs exhibit a maximum external quantum efficiency of about 20% with CIE coordinates of (0.66, 0.34) and an expected half lifetime of about 15,000 h with an initial luminance of 1000 cd m⁻².

**High-Speed and Precise Gap Servo System for Near-Field Optical Recording**

Daiichi Koide, Takeshi Kajiyama, Haruki Tokumaru, Yoshimichi Takano*, Yuta Nabata**, Tokoku Ogata**, Toshimasa Miyazaki**, and Kiyoshi Ohishi**
* NHK Engineering Services, Inc. **Nagaoka University of Technology

We are developing a high-density thin optical disk using near-field optical recording technology for storing ultra-high definition television signals. The use of a high-resolution optical head with a solid immersion lens, a laser beam focused to form a beam spot of half the previous size, and a head positioning control that keeps the gap between the optical head and the disk surface less than 50 nm while the disk is at a high rotational speed are required to record at high speed and high density.

We developed a novel high-speed and precise gap servo system with a feed-forward control method that reduces the harmonic disturbance (RHD-FFC) in a near-field optical recording system. We confirmed that the RHD-FFC method could suppress harmonic disturbances of gap servo errors and could maintain a gap of 25 nm at a rotational speed of more than 7500 rpm, which corresponds to a data transfer rate of 250 Mbps. The test involved using an optical disk with a fourfold higher recording density (data capacity of 100 gigabytes per recording layer) than that of current Blu-ray disks.

**Electret Charging Method Based on Soft X-ray Photoionization for MEMS Transducers**

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Kei Hagiwara, Masahide Goto, Yoshinori Iguchi, Toshifumi Tajima*, Yoshinobu Yasuno**, Hidekazu Kodama**, Kenichi Kidokoro***, Yuki Suzuki****
* NHK Engineering Services, Inc. **Kobayasi Institute of Physical Research *** RION Co., Ltd **** Department of Mechanical Engineering, The University of Tokyo

An electret charging method employing soft X-ray irradiation for microelectromechanical systems (MEMS) electret transducers was investigated. Soft X-rays can penetrate obstructions/narrow gaps and ionize gas molecules inside air gaps. This allows electrets embedded after the fabrication process and vertical electrets on the sidewalls of high-aspect-ratio structures to be charged. The charging properties of polymer electrets subjected to soft X-ray irradiation were systematically examined. The surface potential of the embedded electrets increased linearly with increasing irradiation time. The potential could be precisely controlled by the applied bias voltage. The surface potential of the vertical electrets after charging was uniform to a depth of 20-30 times the gap opening. Since the photoionization rate depends on the collision diameter of the gas molecules with respect to X-rays, a high charging rate was achieved by using Xe gas. In the present charging method, photoionization was found to play a dominant role in generating electrons from gas molecules. Experiments performed at different gas pressures revealed that the effects of photoelectric phenomena and carrier displacement could be neglected. The present charging method was found to have a charge stability as high as that of corona charging. These results indicate that the present charging method has the potential for various new MEMS electret transducer designs.