Sensors and Materials, Vol. 23, No. 7 (2011) 369–379
MYU Tokyo

S & M 0853

Implantable Distributed Biomedical Photonic Devices

Jun Ohta*, Ayato Tagawa, Takuma Kobayashi, Toshihiko Noda,
Kiyotaka Sasagawa and Takashi Tokuda

Graduate School of Materials Science, Nara Institute of Science and Technology,
8916-5 Takayama, Ikoma, Nara 630-0101, Japan

(Received January 13, 2011; accepted February 17, 2011)

Key words: biomedical photonic devices, complementary metal-oxide-semiconductor (CMOS) image sensor, implantable device, distributed implantation, brain imaging

In this paper, we demonstrate an implantable distributed biomedical photonic device that is based on a dedicated complementary metal-oxide-semiconductor (CMOS) image sensor architecture to measure fluorescence by implantation into the deep brain of an untethered mouse. To reduce tissue damage during implantation, an ultrasmall chip is fabricated using a standard 0.35 μm CMOS technology. The chip has an area of 547 ×700 μm^2 and 60×60 pixels and is demonstrated to capture images. An implantable device is fabricated using three microchips, and the fundamental operation of the device is validated. The device successfully detected fluorescence from fluorescent beads excited externally. In addition, the device achieved simultaneous operation of the three microchips with a delay of less than 15 μs.

*Corresponding author: e-mail: ohta@ms.naist.jp