Toward Implantable Active Electronic Devices using Flexible Device Fabrication Process

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Abstract

Bio-integrated implantable electronic devices require high flexibility, bio-compatibility, and stability. Researchers have demonstrated flexible bio-integrated circuits using complementary metal-oxide-semiconductor (CMOS) processes and transfer methods for detecting electrophysiological signals directly on organics. [1–3] CMOS based flexible circuits exhibit high performance and stability but their complex, costly, and unmatured processes remind us of concerns about commercialization. Meanwhile, thanks to the advancement of display technology, many of technical requirements for fabricating flexible multi-functional implantable electronic devices have already been developed by flexible device manufacturing processes including flexible thin-film transistors, light-emitting diodes, and thin-film encapsulation. In this work, as a first step toward implantable active devices, we fabricated the multichannel electroencephalography (EEG) electrode array using flexible device manufacturing processes. As shown in Fig. 1, we implanted the electrode array to the mouse and successfully measured EEG signals for 2 weeks by the wireless communication system. Based on this work, we would like to discuss the feasibility of implantable active electronic devices fabricated via flexible device fabrication processes.

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Keywords: *EEG, multi-electrode array, flexible electrode, implantable device*

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Biography

Chan-mo Kang received the B.S. and Ph. D. degree in electrical and computer engineering from Seoul National University in 2008 and 2014, respectively. He is currently a senior researcher at Electronics and Telecommunications Research Institute (ETRI) in Daejeon, South Korea. His research interests include device engineering and physics in organic electronics, thin-film transistors, flexible and printed electronics, and organic/inorganic hybrid devices