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Hybrid biomaterials for nanobioelectronic device: toward biocomputing system

Hybrid biomaterial for nanobioelectronic devices have emerged as a breakthrough with huge potentiality to generate new concepts and technologies for the development of new age electronic devices. The main concept of bioelectronics was generated from the fact that biomaterial, especially metalloproteins, can be used as a functional unit in an electronic device. Major challenges in bioelectronic field include the miniaturization, and the demonstration of various functions implemented in biomaterial to alter silicon-based electronic devices. It has been difficult to demonstrate a single molecular-based computing device in current computing system, since such silicon-based system requires complex functionality to be developed at the single molecular level. In this point of view, metalloprotein-based conceptual biomemory device was developed which demonstrated memory characteristics including 'read', 'write' and 'erase' function. Further, multi-bit memory function and nanoscale memory function are also demonstrated. Afterwards new hybrid material including metalloprotein/DNA/nanoparticle has been developed to construct bioprocessing device to achieve various functions at the single molecular level. A metalloprotein that exhibits redox property is used as a biomemory signal source, and various nanoparticles with complementary DNA and metal ions are used as input signals to acquire processed output signals. Various functions including 'information reinforcement', 'information regulation' and 'information amplification' are accomplished in this device due to various input signals. The proposed hybrid material-based bioprocessing device by the integration with neural cell should be a new type of platform for development of biomolecular-based biocomputing system.

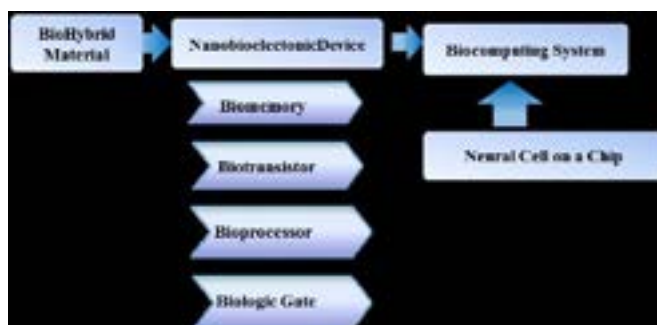


Figure1: Hybrid biomaterial based nanobioelectronic device toward Biocomputing system

Biography

Jeong-Woo Choi received his Ph. D. in 1990 at Rutgers University, USA and D.Eng. at Tokyo Institute of Technology, Japan in 2003. He worked at IBM Almaden Research Center and Mitsubishi Electronics Advanced Technology R&D Center as a visiting researcher in 1993 and 1996, respectively. He has been a professor of Department of Chemical & Biomolecular Engineering, Sogang University, South Korea, for over 25 years. He is a leading researcher in the field of nanobiomaterials and nanobioelectronics. He has published over 370 peer-reviewed papers in Science, Adv. Mater., ACS Nano, Angewandte Chemie, Adv. Funct. Mater., and etc..

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