

Polyaniline-based organic memristive device fabricated by layer-by-layer deposition technique

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Abstract

© 2015, The Korean Institute of Metals and Materials and Springer Science+Business Media Dordrecht. Memristors and memristive devices represent a splendid area of research due to the unique possibilities for the realization of new types of computer hardware elements and mimicking several essential properties of the nervous system of living beings. The organic memristive device was developed as an electronic single-device analogue of the synapse, suitable for the realization of circuits allowing Hebbian type of learning. This work is dedicated to the realization of the active channel of organic memristive devices by polyelectrolyte self-assembling (layer-by-layer technique). Stable and reproducible electrical characteristics of the device were obtained when the thickness of the active channel was more than seven bilayers. The device revealed rectifying behaviour and the presence of hysteresis—important properties for the realization of neuromorphic systems with synapse-like properties of the individual elements. Compared to previously reported results on organic memristive devices fabricated using other methods, the present device does not require any additional doping that is usually performed through acid treatment. Such a behaviour is extremely important for the cases in which biological systems (nervous cells, slime mould, etc.) must be interfaced with the system of organic memristive devices, since acid treatment can kill living beings. [Figure not available: see fulltext.]

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Keywords

organic memristive device, polyaniline, polyethylene oxide, resistance switching