

Nanowire memristor

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Self-assembled one-dimensional “nanowires” have attracted much attention not only for their nanoscale-confined physical properties but also for novel nano-device applications. Group VI and III-V compounds nanowires have proven their great promises for exploring fundamental physical properties at nanoscale and also the feasibility of diverse nano-device applications. There are several reasons why nanowires have attracted much attention from diverse research communities ranged from physics, chemistry, material science, electrical engineering, chemical engineering and others. First, the size scale can be easily down to several nanometers, where conventional lithographic technologies are not feasible. Second is the variation of material employed to be one. Metal oxides exhibit their rich variety of physical properties including ferroelectric, ferromagnetic, high-T_c superconducting, memristive switching, which are hardly attainable to other materials. Among them, resistance switching (RS) memory effect, which occurs within a metal/oxide/metal junction, so called “memristive switching”, have attracted much attention due to the potential applications not only for next generation non-volatile memories alternative to current flash memory technology but also for artificial neural computing systems beyond Boolean computing. Although the importance of nanoscale physical events on RS has been highlighted in previous works using thin film RS devices, investigating the occurrence of RS at nanoscale beyond the limitation of current lithographic length scales and extracting the exact nanoscale RS mechanisms have been difficult. However such knowledge as to nanoscale RS events is crucial to achieve reliable and high-density RS devices. Self-assembled oxide nanowire-based RS offers an alternative approach not only to reduce the size of the cells beyond the limitation of current lithographic length scales but also to extract the underlying nanoscale RS mechanisms. Here we report the fabrication of well-defined oxide nanowires via VLS mechanisms, the construction of heterostructured oxide nanowires and the nonvolatile resistive memory switching phenomena within a single oxide nanowire down to 10 nm scale. Single crystalline NiO_x and CoO_x heterostructured nanowires were fabricated by newly developed in-situ formation technique. We constructed highly stable RS junctions with the endurance up to 10⁸ by utilizing self-assembled nanowires and well-defined nano-gap electrodes. The importance of nanoscale redox events was clarified for the bipolar RS. The presented approaches by utilizing self-assembled oxide nanowire/metal junctions offer an important system and platform to investigate not only nanoscale RS mechanisms but also various nanoscale confined physical properties of transition metal oxides.

Biography

Takeshi Yanagida has completed his Ph.D. from Teesside University. He is Associate Professor in Osaka University. He has published more than 100 papers in reputed journals.

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Novel methods and techniques of lipid-based drug delivery systems for hydrophobic drugs

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Many drugs, including some obtaining high therapeutic efficacy, are hydrophobic and therefore require a solubilization process to enable their administration. Recent progress in lipid-based drug delivery systems (DDS) technology with compartments in hydrophilic drugs to improve the delivery of pharmaceuticals with poor bioavailability by improving their stability, circulation times in the targeted drug delivery. Hydrophobic drugs can be dissolved within the lipid-based DDS. The question asked in this review is if any one lipid-based DDS, regardless of its composition, can provide the extended drug retention, long lifetime in the circulation, active targeting to specific tissues and rapid and controllable drug release at the site of interest. As an alternative, we review methods of novel techniques including liposomes, solid lipid nanoparticles (SLN), nanostructured lipid carriers (NLC), lipid nanospheres (LNS), Surface modifications of lipid-based nanoparticles and lipid emulsions have been developed and used as anticancer drug delivery carriers to improve the drugs solubility, dissolution rate and absorption.

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