SM-P003

A Light Incident Angle Stimulated Memristor Based on Electrochemical Process on the Surface of Metal Oxide

박진주, 용기중

POSTECH

Memristor devices are one of the most promising candidate approaches to next-generation memory technologies. Memristive switching phenomena usually rely on repeated electrical resistive switching between non-volatile resistance states in an active material under the application of an electrical stimulus, such as a voltage or current. Recent reports have explored the use of variety of external operating parameters, such as the modulation of an applied magnetic field, temperature, or illumination conditions to activate changes in the memristive switching behaviors. Among these possible choices of signal controlling factors of memristor, photon is particularly attractive because photonic signals are not only easier to reach directly over long distances than electrical signal, but they also efficiently manage the interactions between logic devices without any signal interference. Furthermore, due to the inherent wave characteristics of photons, the facile manipulation of the light ray enables incident light angle controlled memristive switching. So that, in the tautological sense, device orienting position with regard to a photon source determines the occurrence of memristive switching as well. To demonstrate this position controlled memory device functionality, we have fabricated a metal-semiconductor-metal memristive switching nanodevice using ZnO nanorods. Superhydrophobicity employed in this memristor gives rise to illumination direction selectivity as an extra controlling parameter which is important feature in emerging. When light irradiates from a point source in water to the surface treated device, refraction of light ray takes place at the water/air interface because of the optical density differences in two media (water/air). When incident light travels through a higher refractive index medium (water; n=1.33) to lower one (air; n=1), a total reflection occurs for incidence angles over the critical value. Thus, when we watch the submerged NW arrays at the view angles over the critical angle, a mirror-like surface is observed due to the presence of air pocket layer. From this processes, the reversible switching characteristics were verified by modulating the light incident angle between the resistor and memristor.

Keywords: memristor, superhydrophobic, Resistive switching