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Complementary resistive switch based on nanostructured memristors

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Since the first realization of capacitor in 1745 followed by conceptualization of resistor and inductor in 1827 and 1831 respectively, the design community has been limited to these three fundamental passive circuit elements. Memristor and memristive constructs at nanoscale have emerged over the last few years through a combination Metal-Insulator-Metal (MIM) processing technology; thus paving the way for an efficient adoption of memristor constructs such as ReRAM crossbar-based architectures. However, a noticeable drawback of the crossbar architecture that remembers to be solved is the existence of sneak-paths between adjacent cells.

This work presents a novel approach in implementation of complementary resistive switch based on transparent memristors. The upper TiO_{2-x} layer was deposited by atomic layer deposition using titanium tetra-isopropoxide and O_2 as the precursor and the oxygen source respectively; with oxygen deficiency of 5%. The lower TiO_2 is 4 nm thick while the upper TiO_{2-x} layer is 12 nm thick. The fabricated MIM structure has shown promising results in terms of functional reproducibility and high speed switching for digital and low-voltage analog application.

Biography

Sung-Jin Kim received the Ph.D. degree in the School of Electrical and Computer Engineering from Seoul National University, Seoul, Korea, in 2006. In 2007, he was a Postdoctoral Research Scientist with the Department of Electrical Engineering, Columbia University, New York, NY, where he was initially engaged in research on the application of nano technology and new processing strategies for highly integrated systems. In 2008, he joined the School of Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, GA, as a Postdoctoral Fellow working on solution-processablenano structured devices. His current research interests include the nanodevices, flexible nanoprinting electronics, and energy harvesting nano applications.

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