Investigation of Microwave Annealing on Resistive Random Access Memory Device with Atmospheric Pressure Plasma Enhanced Chemical Vapor Deposition Deposited IGZO Layer

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Abstract

Non-volatile memory (NVM) is essential in almost every consumer electronic products. The most prevalent NVM used nowadays is flash memory (Meena, J.S., et al., 2014. Overview of emerging nonvolatile memory technologies. Nanoscale Res. Letters, 9(1), p.526). However, some bottlenecks of flash memory have been identified, such as high operation voltage, low operation speed, and poor retention time. Resistive random access memory (RRAM) is considered to be the most promising one to become the next generation NVM device since its simple structure, fast program/erase speed, and low power consumption. In this experiment, the RRAM device is fabricated, and its IGZO (memory) layer is deposited with AP-PECVD technique which can reduce cost of the process. Microwave annealing (MWA) is used to enhance electrical characteristics of the RRAM device (Fuh, C.S., et al., 2011. Role of environmental and annealing conditions on the passivation-free In-Ga-Zn-O TFT. Thin Solid Films, 520, pp.1489-1494). Experiment results show that with appropriate MWA treatment, the IGZO RRAM device exhibits better electrical characteristics under bipolar operation, all forming/set/reset voltage for RRAM device is simultaneously lowered.

Keyword: RRAM; a-IGZO; AP-PECVD; Microwave Annealing