Extended Abstracts of the 2008 International Conference on Solid State Devices and Materials, Tsukuba, 2008, pp. 1162-1163

J-9-1 (Invited)

Interpretation of Resistive Switching in NiO Thin Films

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1. Introduction

It has been pointed out that resistive switching in NiO shows abnormal statistical distribution that cannot be controlled. Several switching mechanisms explained the source of such irregularity with no sufficient correlation. This talk will present the source of switching parameters by interpreting statistical characteristics and give an idea how to control switching.

2. Nature of switching

Our interpretation shows that switching is controlled by switching power rather than either voltage or current. Poisson's distribution is applicable to switching in NiO with the equation:

$$P(m) = \frac{a^m e^{-a}}{m!}$$

, where $P(m)$ is probability density function of NiO switching, a is product of probability of conducting path formation, p, and total possible number of conducting path, n, in the switching area, and m is the number of successes to form conducting spots in area, A.

3. Applications

A technique to control switch will is presented that can be applied to commercial product even without improving switching properties. Consecutive pulses are applied to the NiO to guarantee full switching. In addition, the direction how to develop resistance changing memory is presented by comparing Z- stack structure with X-stack one in cross-point architecture.

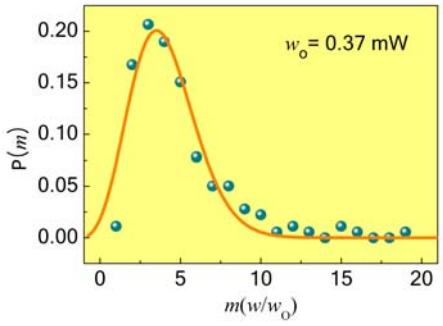

Fig. 1 Curve fitting of NiO switching that follows Poisson's distribution.

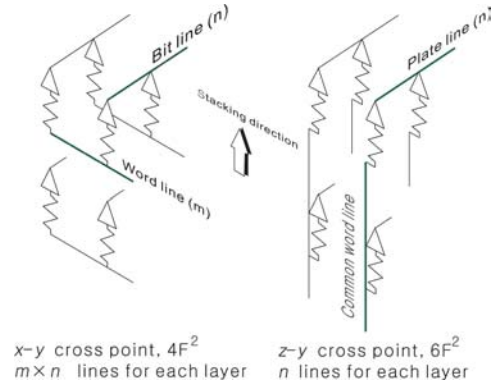

Fig. 2 Memory architecture in cross-point structure.