

Supplementary Information

Roles of Oxygen and Nitrogen in Control of Nonlinear Resistive behaviors via Filamentary and Homogeneous Switching in Oxynitride Thin Film Memristor

Yu-Chuan Shih, Tsang-Hsuan Wang, Jian-Shiou Huang, Chih-Chung Lai, Ying-Jhan Hong,
and Yu-Lun Chueh

Department of Materials Science and Engineering, National Tsing Hua University, Hsinchu,
30013, Taiwan, R.O.C.

*Corresponding Author: ylchueh@mx.nthu.edu.tw

*E-mail: ylchueh@mx.nthu.edu.tw

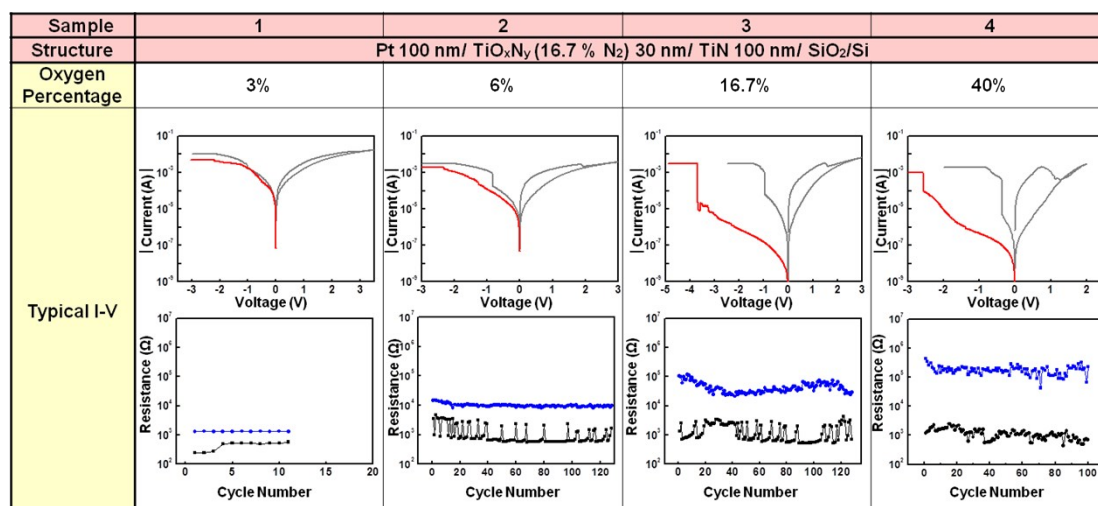


Figure S1 I-V behaviors at different oxygen concentrations. The behavior is similar at different oxygen concentrations once the higher HRS is higher. The jump points in the LRS indicates the occurrence of the non-linear behavior.

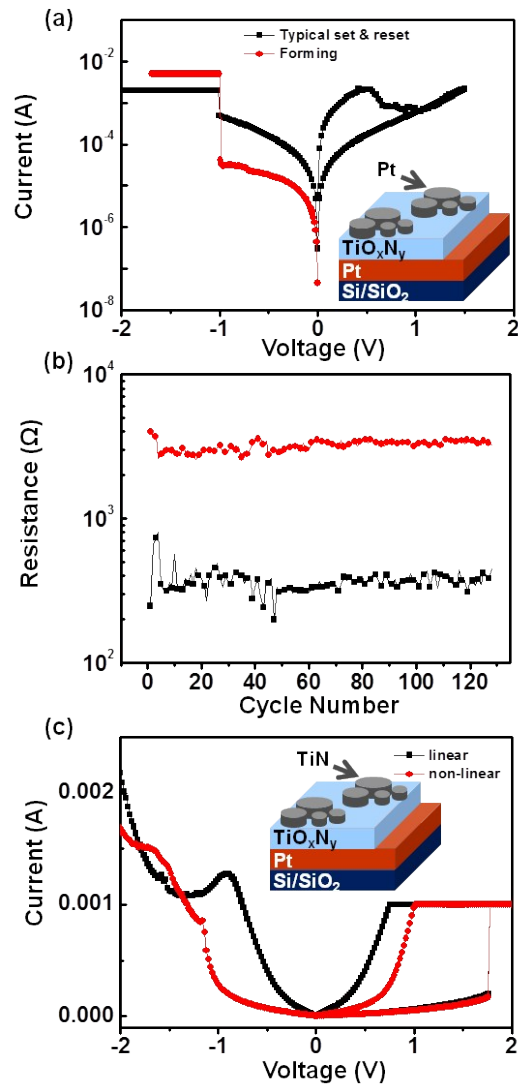


Figure S2 Electrical behaviors for different stackings of ReRAM devices. (a) Typical I-V curves of Pt/TiO_xN_y/Pt ReRAM. (b) Endurance test of Pt/TiO_xN_y/Pt. Obviously, no non-linear behavior was observed. (c) Typical I-V curves of TiN/TiO_xN_y/Pt device. The non-linear behavior can be also found at the applied negative bias.

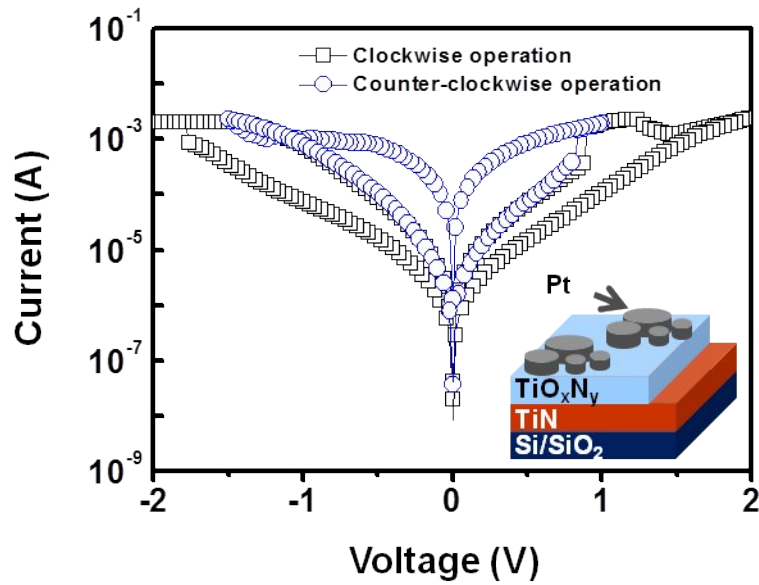


Figure S3 The clockwise followed by the counter-clockwise operation of TiN/TiO_xN_y/Pt ReRAM. When the current jumped at about 1V, we stopped the operation and reverse the operation direction. The black loop was counterclockwise operation while the blue loop was ordinary clockwise operation. Adding up two cycles could be regarded as a simple ReRAM with no non-linear behavior. The interchangeable of three states proved the mechanism we proposed.