

## Supplementary information

### Spatially Confined Electric field Effect for Improved Resistive Switching Behavior of a Ni/Ta-embedded TaO<sub>x</sub>/NiSi Device

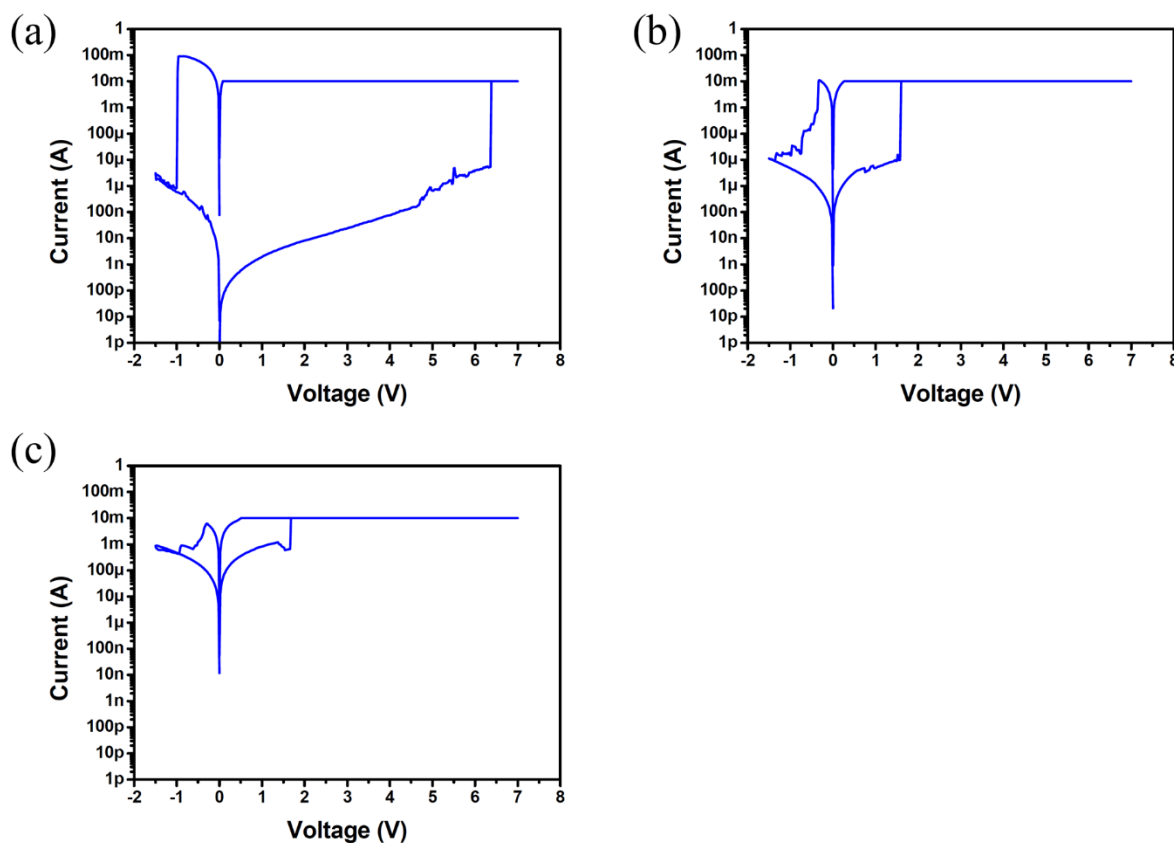
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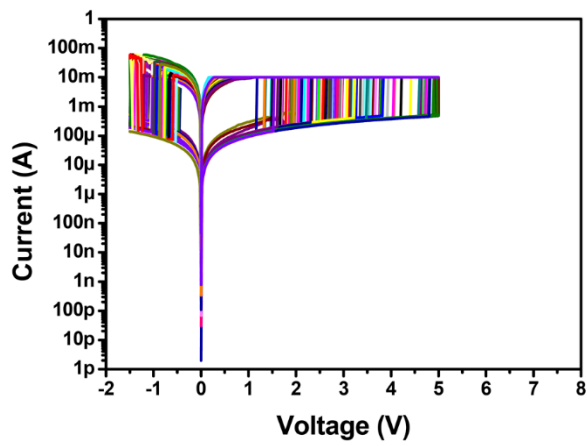
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#### S1 I-V curves extracted from without Ta embedded device

As shown in S1, the operation mechanism of device cannot explain by formation/rupture of Ni CF. S1 (a) show conventional CBRAM I-V curve which operation mechanism is formation/rupture of Ni CF. However, operation mechanism shown in S1 (b) is combination of Ni CF and Vo. In addition, only

Vo CF operation mechanism was observed as shown in S1 (c). Therefore, without Ta embedded device has unstable switching characteristic because three mechanism struggle to operate device.



### S2 Continuous 200cycle I-V curve of Ta embedded device

S2 show continuous 200cycle I-V curve of Ta embedded device. Unlike device without Ta embedded layer, operation mechanism is only formation/rupture of Ni CF.