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To
Benjamin Werth
Senior Science Editor
JoVE

**Functional Materials and
Microsystems Research
Group**

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Dear Benjamin Werth,

We are pleased to submit our invited manuscript entitled "Fabrication process and *in situ* nanostructural analysis methodology of volatile threshold switching in mixed-phased $a\text{-VO}_x$ based asymmetric crossbars" for consideration for publication in *JoVE*.

Nanoscale resistive memories are building blocks for future energy-efficient logic technology and brain-inspired neuromorphic computing hardware. Creating memory elements and understanding its operation mechanisms that can be programmed to demonstrate different switching performance – optimised either for logic or neuromorphics or for performance or energy efficiency – is critical to advancements in this field.

In this work, we demonstrate complete fabrication process and the methodology of transmission electron microscopy analysis with *in situ* biasing in the cross-point device structure. The representative results used here from this experiment are already published in *Advanced Electronics Materials* entitled as "*In situ* nanostructural analysis of volatile threshold switching and nano-volatile bipolar resistive switching in a mixed-phase $a\text{-VO}_x$ asymmetric crossbars".

Our findings demonstrate an experimental procedure which has significant impact in the field of resistive random access memories (RRAM) to study the nanostructural changes visually *in situ*. This can reveal the underlying mechanisms with reliable evidences and develop significant understanding of the device behaviours.

We believe that our video manuscript will appeal to the diverse group of researchers from resistive random-access memories, nanoelectronics, green electronics, thin film material science, physics, and electron microscopists.

Each author herein confirms that methodology part of this work has not been previously published in any peer-reviewed journal and is not currently under consideration by any other journal. However, the representative results used here are already published which have been reference correctly and reuse permissions have been received. All authors have substantially contributed to the research activities and in preparation of this manuscript. Finally, we declare no competing financial interests.

Yours sincerely,



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