

Supplementary Materials for

**Magnetization switching through domain wall motion in Pt/Co/Cr
racetracks with the assistance of accompanying Joule heating effect**

**Baoshan Cui, Dong Li, Jijun Yun, Yalu Zuo, Xiaobin Guo, Kai Wu, Xu Zhang, Yupei Wang, Li
Xi*, and Desheng Xue**

Key Laboratory for Magnetism and Magnetic Materials of Ministry of Education & School of Physical
Science and Technology, Lanzhou University, P. R. China

***Authors to whom correspondence should be addressed. E-mail: xili@lzu.edu.cn**

SI-m1. A movie shows domain wall propagation along the track from left side to right side driven by
out of plane magnetic fields with magnitude around 9.68 mT.

SI-m2a. A movie shows domain wall propagation under 8.47 mT out of plane magnetic field with
magnitude, width and period respectively around +22.6 V, 100 ns, and 10 μ s voltage pulses
always applied. One can see the domain wall propagation was blocked by the positive current
pulse.

SI-m2b. A movie shows domain wall propagation under 8.57 mT out of plane magnetic field with
magnitude, width and period respectively around -22.6 V, 100 ns, and 10 μ s voltage pulses
always applied. One can see the domain wall propagation was accelerated by the negative current
pulse.

SI-m3. A movie shows domain wall nucleation and propagation with the magnetic field sweeping
cycling from -13.04 mT to 13.04 mT, then to -13.04 mT again under a 50 V voltage pulse with
width 100 ns and period of 10 ms. One can see the initial nucleation position changing to the left
end of the track from the position as shown in SI-m1, SI-m2a and SI-m2b movies.

SI-m4a. A movie shows DWM by the current pulse from left side to right side for a -45 V voltage pulse
without the assistance of magnetic field. The domain wall was nucleated and propagated under a
field of 7.66 mT, which was lasted around 5 seconds, then the field was set to zero, at the time
scale around 7 s, the negative 44.5 V voltage pulse with width 100 ns and period 10 μ s was turned
on.

SI-m4b. A movie shows DWM by the current pulse from right side to left side for a + 44.6 V voltage pulse without the assistance of magnetic field. The domain wall was nucleated and propagated under a field of 8.86 mT, which was lasted around 8 seconds, then the field was set to zero, at the time scale around 14 s, the positive 44.6 V voltage pulse with width 100 ns and period 10 μ s was turned on.