

# Time-dependent Thermoelectric Switching of Vanadium Dioxide

G. Ábel<sup>1</sup>, M. Kiwi<sup>1,2</sup>, F. Torres<sup>1,2</sup>

1. Depto. de Física, Facultad de Ciencias, Universidad de Chile, Santiago, Chile

2. Centro para el Desarrollo de la Nanociencia y la Nanotecnología, CEDENNA, Santiago, Chile

**INTRODUCTION:** MIT (Metal-insulator transitions) of a thin VO<sub>2</sub> layer are investigated as a thermoelectric response to a continuous pulse. This is a nano-scale device which, subject to large temperature gradients, can trigger a MIT.

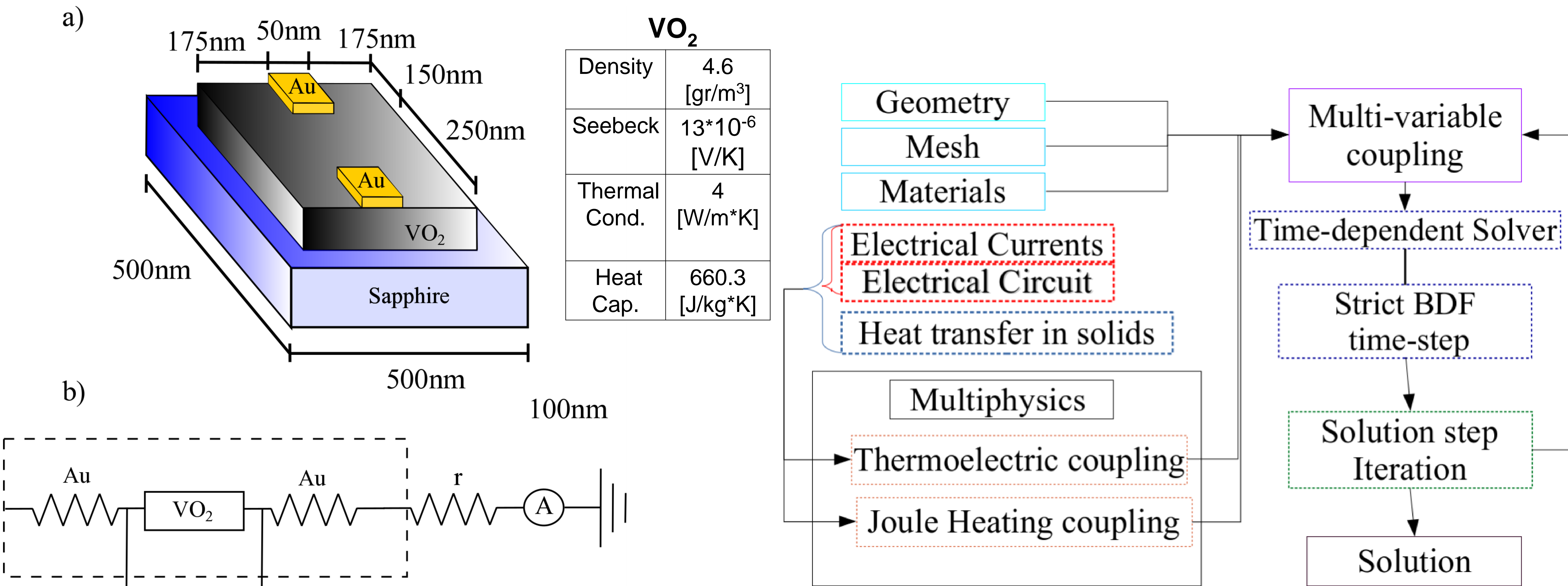


Figure 2. Flow diagram of numerical simulation.

Figure 1a. Schematic representation of the device, which consists of two nano-scale gold contacts deposited on a thin VO<sub>2</sub> film. 1b. Circuit node set-up.

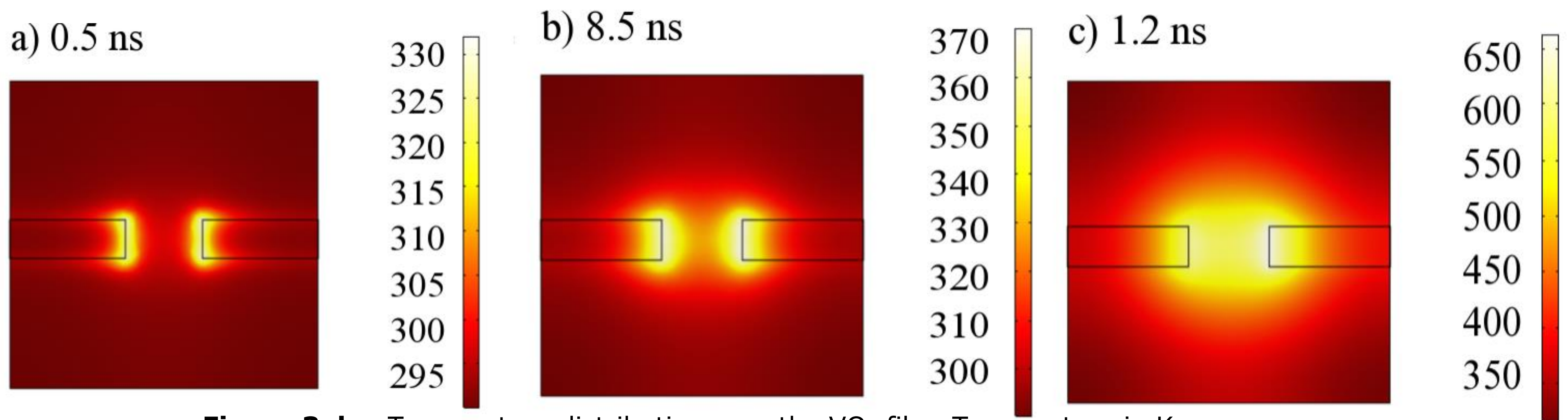


Figure 3abc. Temperature distribution over the VO<sub>2</sub> film. Temperature in K.

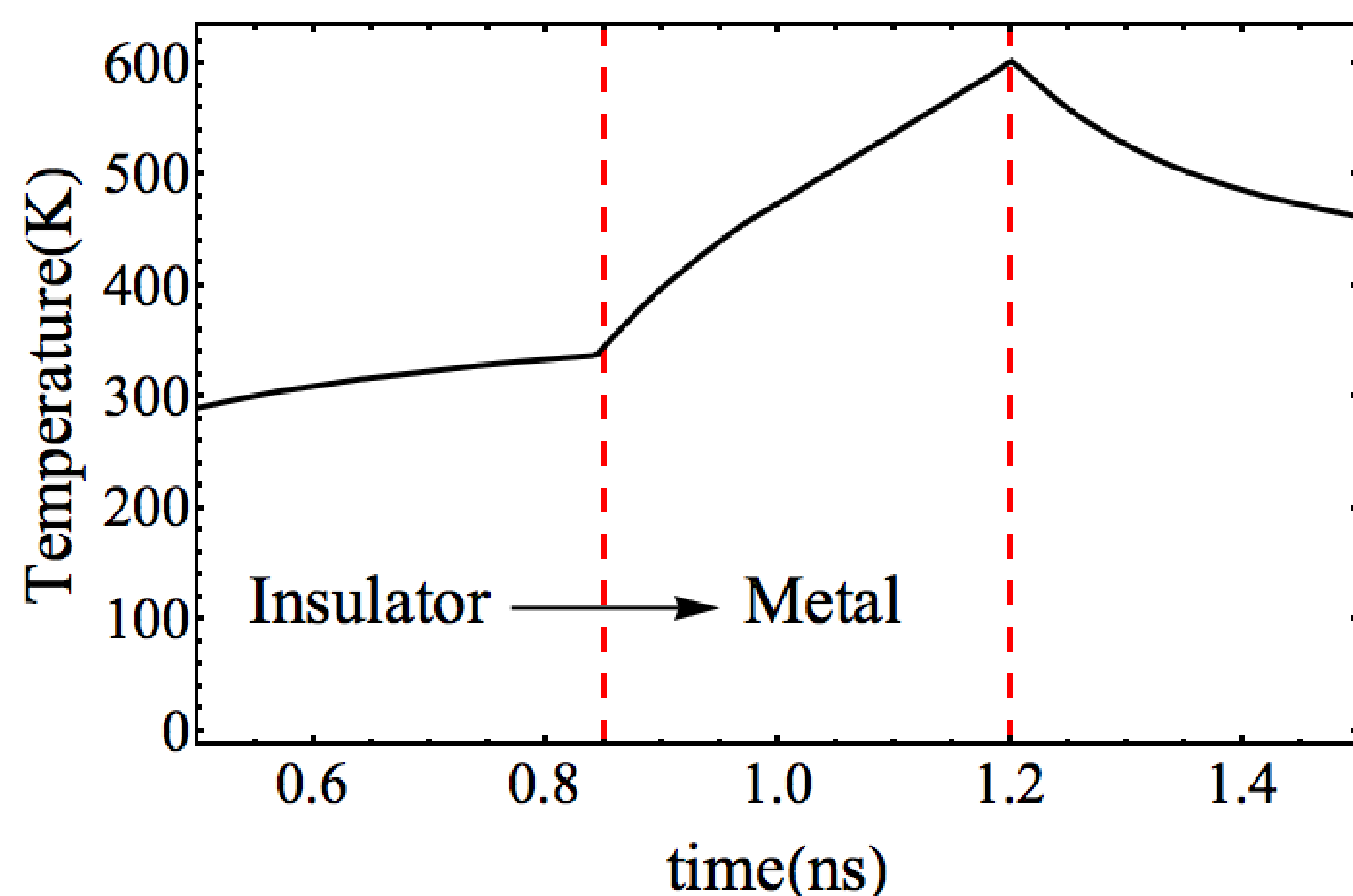


Figure 4. Contact temperature of VO<sub>2</sub> and Au, as a function of time.

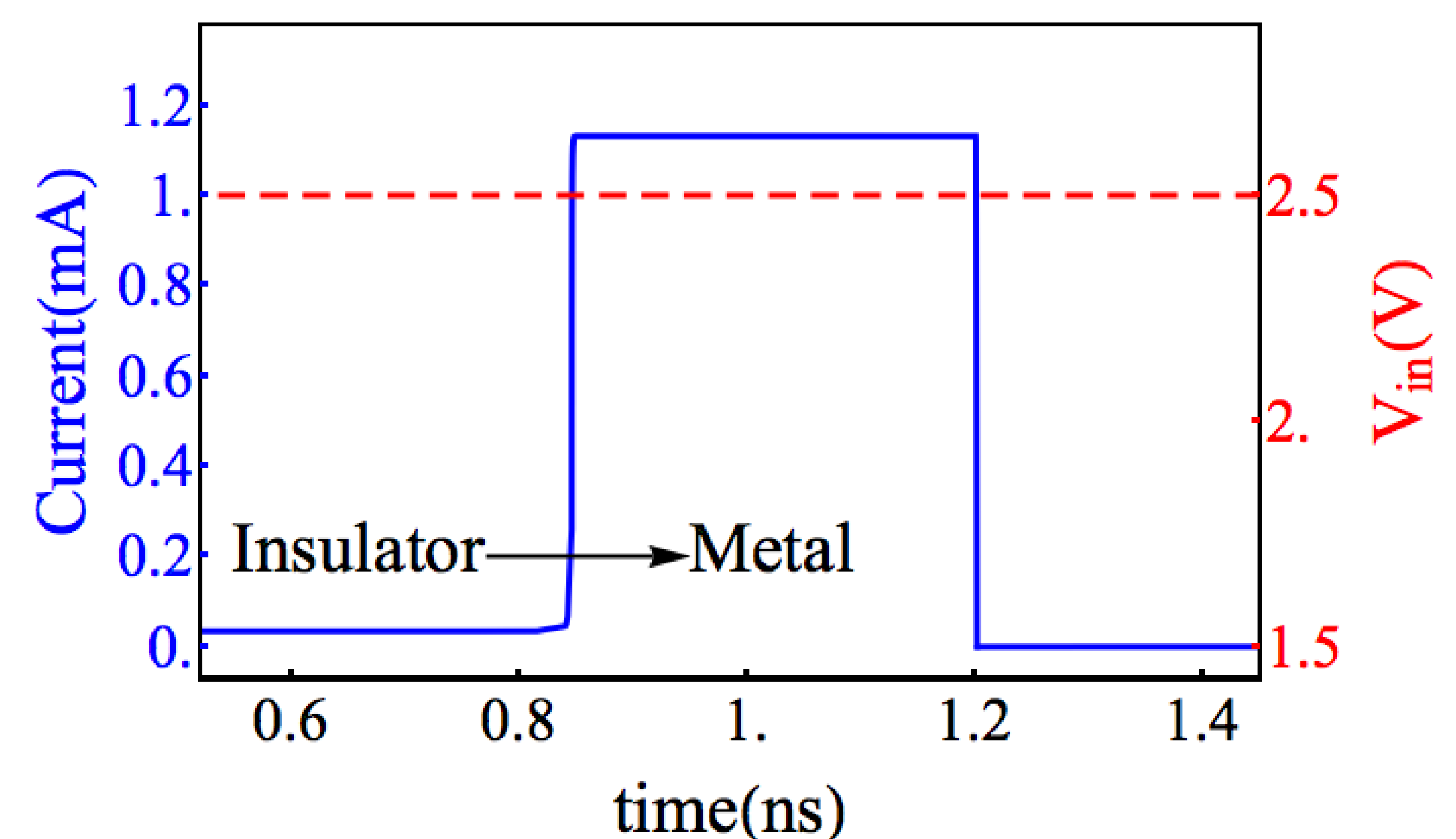


Figure 5. Current vs. time. A VO<sub>2</sub> metal-insulator phase transition is activated by the thermal switching due to the voltage pulse.

**REFERENCES:**

1. L. I. Anatyshuk, Physics of Thermoelectricity (Institute of Thermoelectricity, (2008)
2. A. Zylbersztein and N. Mott, Phys. Rev. B **11**, 4383–4395 (1975).
3. E. Abreu et al. Phys. Rev. B **96**, 094309 (2017).
4. J. G. Ramirez, I. K. Schuller et al. Phys. Rev. B. **B91**, 205123 (2015)