Defective WO_{3-x} nanowire: possible long lifetime semiconductor nanowire point electron source

Zufang Lin, Runze Zhan, Yicong Chen, Juncong She, Shaozhi Deng, Ningsheng Xu and Jun Chen*

State Key Laboratory of Optoelectronic Materials and Technologies, Guangdong Province Key Laboratory of Display Material and Technology, School of Electronics and Information Technology, Sun Yat-sen University, Guangzhou 510275, People's Republic of China

* E-mail: stscjun@mail.sysu.edu.cn

S1. Electrical transport properties of WO_{3-x} nanowire (NW) measured in the vacuum. As WO_{3-x} NWs are gas sensitive, their electrical transport properties may be influenced while measurements are carried out in the atmosphere. This is because transport electrons are easily captured by surface defects, and thus the measured conductivity of the NW will be reduced. In order to insure the accuracy of the calculation of Q, we also carried out the electrical transport measurement in vacuum. The results show that the slope of the fitting plot using defect–related transport mechanism tested in vacuum is the same with the slope tested under N_2 atmosphere for the same NW, as shown in Fig. S1. This indicates that Q is a reflection of the own characteristic of the NWs and it is not affected by adsorption. Therefore, the results obtained under N_2 atmosphere can be adopted.

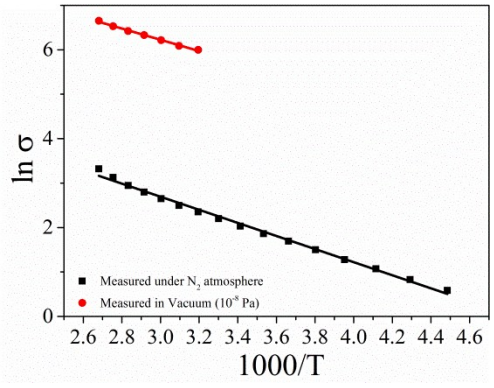

Fig. S1 Conductivity as function of temperature characteristics. The conductivity σ is

in S/m, and the temperature T is in K. Experimental results and fitting results using defect–related transport theory of the WO_{3-x} NW sample. Red circle is the result measured in the vacuum (10^{-8} Pa) and black square is the result measured under N_2 atmosphere.

S2. SEM images of another sample undergoing non-catastrophic breakdown process.

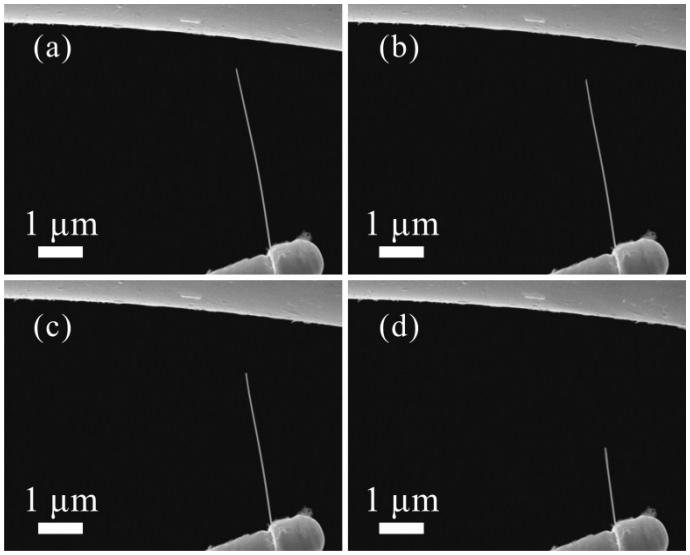

Fig. S2 SEM images of another sample undergoing non-catastrophic breakdown process. (a) Before breakdown. After the first (b), second (c) and third (d) breakdown event.

S3. SEM images of the NW before and after non-catastrophic breakdown, respectively.

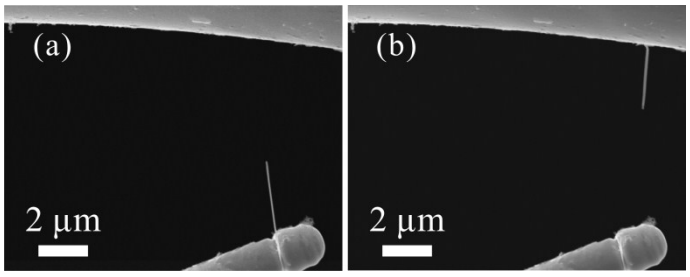

Fig. S3. The WO_{3-x} nanowire before (a) and after (b) non-catastrophic breakdown.