Supporting Information

Electronically driven amorphization in phase-change In_2Se_3 nanowires

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Simulations of the nanowire temperature:

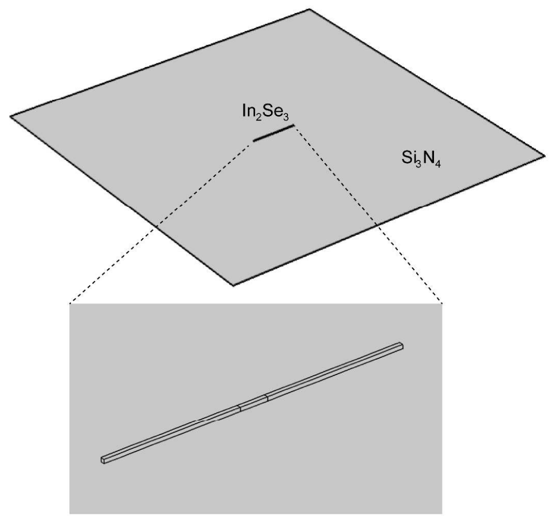

Figure S1 Schematic geometry used in the calculation of the nanowire temperature under a local optical excitation.

The calculation was performed using a commercial software (COMSOL MultiPhysics). The three-dimensional geometry used in the calculation is shown in Figure S1. Specifically, for the case of local optical excitation, a 7 µm long In_2Se_3 nanowire was placed on a 50 × 50 µm Si_3N_4 window, as shown in Fig. S1. The thickness of the Si_3N_4 window is 50 nm. After taking into account the nanowire diameter and the optical spot size, the optical power that illuminates the nanowire was estimated to be ~ 0.2 mW. A total optical absorption in In_2Se_3 nanowires was assumed in the simulation, which should provide an upper limit of the temperature; this is confirmed by the Raman studies (see the text). The optical power (0.2 mW) was dissipated through the 600 nm-long segment in the middle of the nanowire, corresponding to the diffraction-limited laser spot size. The thermal boundary resistance per unit area between the nanowire and the underneath Si_3N_4 layer was set to be 10^7 W/m^{2}K, which is the typical value for the nanowire-Si_3N_4 interface.[1] The temperature of the side surfaces of the Si_3N_4 window was set to be at the ambient temperature for the simulations, as these sides are connected to and supported by Si substrates.

Material parameters used in the calculations are listed in Table S1. An anisotropic thermal conductivity *k*, corresponding to the layered structure, was used for In_2Se_3. However, there are no literature results for *k* along the c axis, to the best of our knowledge. Therefore, the value (1.15 W/mK) from In_4Se_3, which has a similar layered structure, was used.[2] In the simulations, we did not consider the radiation and the air conduction/convection in dissipating the heat generated from the optical excitation, since the contributions from these mechanisms are usually small.[3]

Table S1. Material parameters used in the simulation

	Si	Si_3N_4	In_2Se_3
Heat capacity (C_p), J/kgK	703	700	268 (Ref. 4)
Thermal conductivity (*k*), W/mK	163	20	along the a-b axes: 70 (Ref. 5) along the c axis: 1.15 (Ref. 2)

References cited:

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5. B. Yu, S. Y. Ju, X. H. Sun, G. Ng, T. D. Nguyen, M. Meyyappan, D. B. Janes, *Appl. Phys. Lett.* **2007,** 91, (13), 133119.