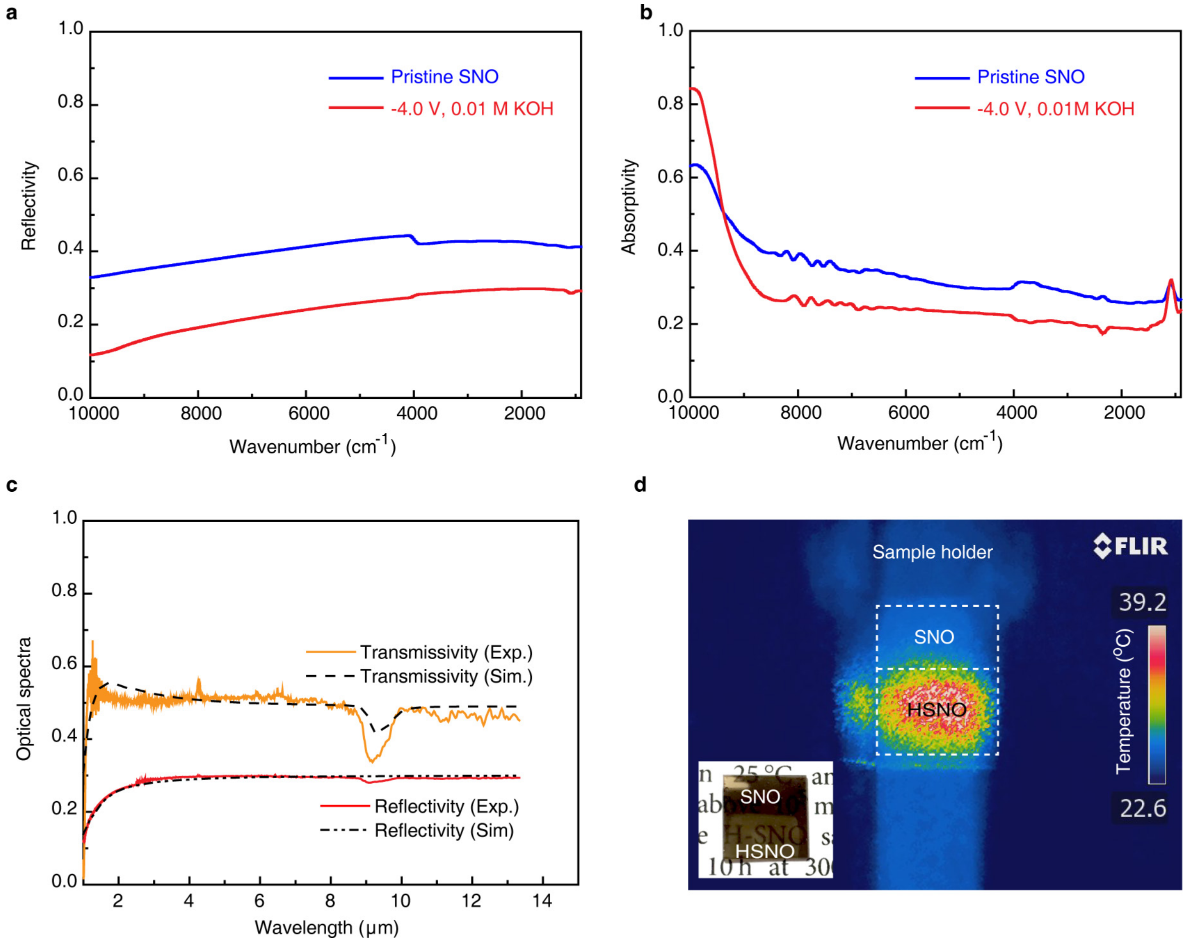

Extended Data Figure 8 | Optical spectra of water-treated SNO. **a**, **b**, Reflectivity (**a**) and absorptivity (**b**) of pristine and water-treated (−4.0 V, 30 s, in 0.01 M KOH aqueous solution) SNO thin film deposited on a Si substrate. After the treatment, the SNO sensing device shows reduction in both reflectivity and free-electron absorptivity, concurrent with a large increase in electrical resistance. **c**, Finite-difference time-domain simulation of optical spectra of water-treated SNO/SiO_2/Si thin film devices. The experimental results of the transmissivity and reflectivity of water-treated SNO are compared with finite-difference time-domain simulation results of HSNO/SiO_2/Si thin film devices, where the optical parameters of samples treated with gas-phase hydrogen[27] were adopted for HSNO. The good agreement between experimental and simulation results indicates the occurrence of a phase transition from SNO to HSNO during water treatment with no material decomposition. The thickness of SNO and SiO_2 was obtained from neutron reflectivity data. The SiO_2 layer between the SNO thin film and Si, which is formed during film synthesis, contributes to the absorption feature observed at 9.2 μm in the transmission spectra. **d**, An infrared image of a SNO/$LaAlO_3$ sample with water treatment on a selected area (FLIR, infrared camera). SNO becomes more transparent (red colour) in the infrared wavelength range at $\lambda = 8$ μm after the treatment. The inset shows a photograph of the sample, where the transparency of the treated area can be observed in the visible wavelength range.