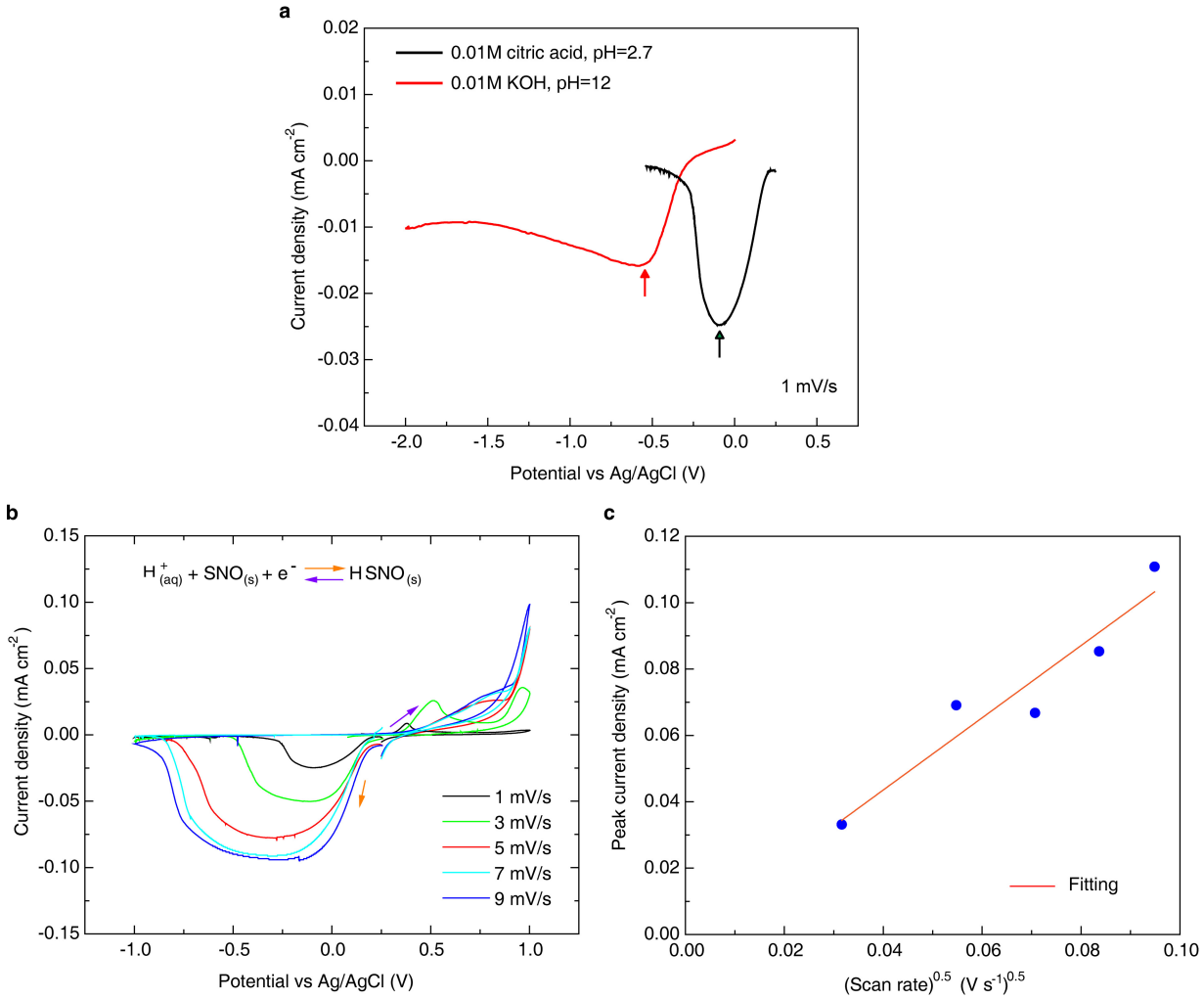

Extended Data Figure 4 | Cyclic voltammograms of SNO thin films. **a**, Dependence of water-mediated phase transition in SNO on pH values spanning from an acidic solution (0.01 M citric acid, pH = 2.7) to a basic solution (0.01 M KOH, pH = 12). The transition from SNO to HSNO shifts to more negative potential values with increasing pH, where greater bias is required to compensate for the reduction of the proton activity in the basic solutions. **b**, Cyclic voltammogram and accompanying reaction for SNO in 0.01 M citric acid from 1.0 V to −1.0 V (versus Ag/AgCl) at various scan rates. Cathodic current peaks at negative potentials indicate the charge transfer as the Ni^{3+} is reduced to Ni^{2+}. The peak position varies as a function of scan rate, indicating that the reaction is kinetically limited by the charge and mass transfer. **c**, Linear relationship between peak cathodic current density (I_p/A) and the square root of the scan rate ($\nu^{0.5}$). The best fit to the Randles–Sevcik equation[23] estimates the number of electrons transferred in the rate-limiting step as 0.95 (Supplementary Information section 4), indicating that the Ni in SNO is almost fully reduced from Ni^{3+} to Ni^{2+} upon intercalation.