

Fig. S1 (a) applied power for melting – melting point for several materials and (b) applied power – calculated source temperature of CuO_x for several deposition rates.

In thermal evaporation system, the source temperature is controlled by applied power on heating element (we used W boat) and the temperature is proportional to applied power. Fig. S1(a) shows the relationship between applied power and source temperature (melting point of evaporating source) in our thermal evaporating equipment. As increasing the applied power from 20 to 80 W, source temperature also increased from 487 °C to 1800 °C. This result implies that we can control the source temperature by changing the applied power of equipment. In the case of CuO_x, the deposition rate is changed from 0.03 Å/s to 2 Å/s by increasing applied power from 515 to 758 °C. Because the phase transform of CuO_x can be occurred in the range from 300 °C to 700 °C under vacuum condition, we could control both deposition rate and phase (stoichiometry) of CuO_x by changing the applied power.