Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.
This journal is © The Royal Society of Chemistry 2023

Supplementary Information[1]

CVD-deposited Cu_2O thin-films with record Hall hole mobility of 263 cm^2/Vs and field-effect mobility of 0.99 cm^2/Vs

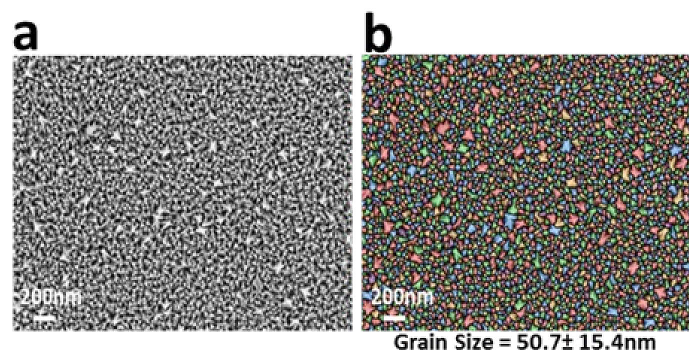
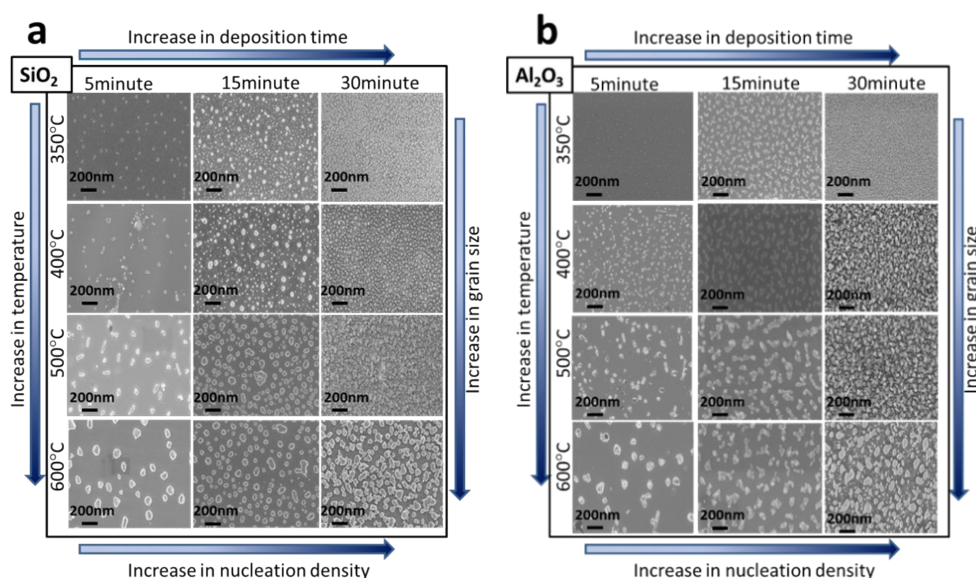


Fig S1 (a) SEM and (b) processed SEM images of Cu_2O film deposited on SiO_2 at ~100 nm/10 min



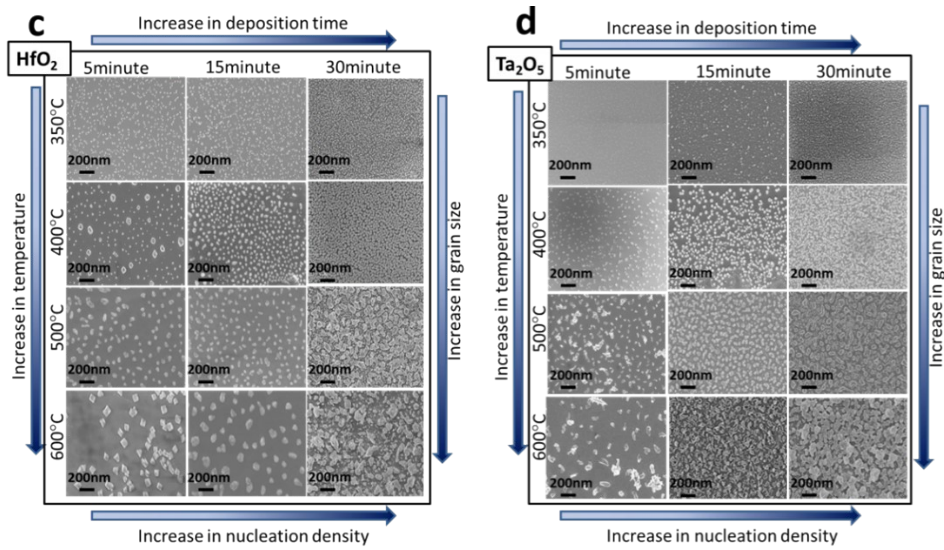


Fig S2 Cu_2O depositions on (a) SiO_2 (b) Al_2O_3 (c) HfO_2 and (d) Ta_2O_5 at different temperatures (350⁰C, 400⁰C, 500⁰C, and 600⁰C), for different durations (5 min, 15 min and 30 min).

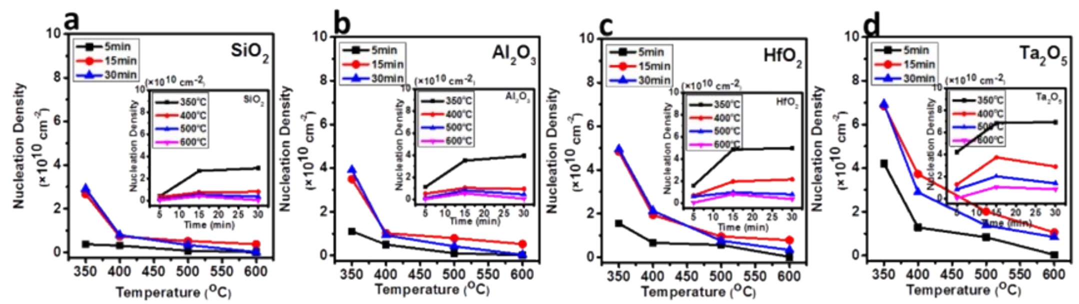


Fig S3 Nucleation density vs Temperature & duration: (a) SiO_2 (b) Al_2O_3 (c) HfO_2 and (d) Ta_2O_5

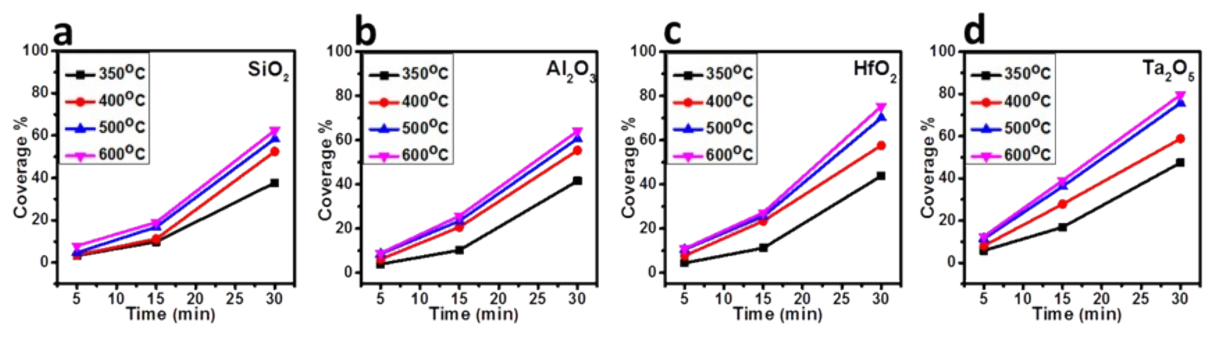


Fig S4 Coverage vs duration, at different temperatures (a) SiO_2 (b) Al_2O_3 (c) HfO_2 and (d) Ta_2O_5

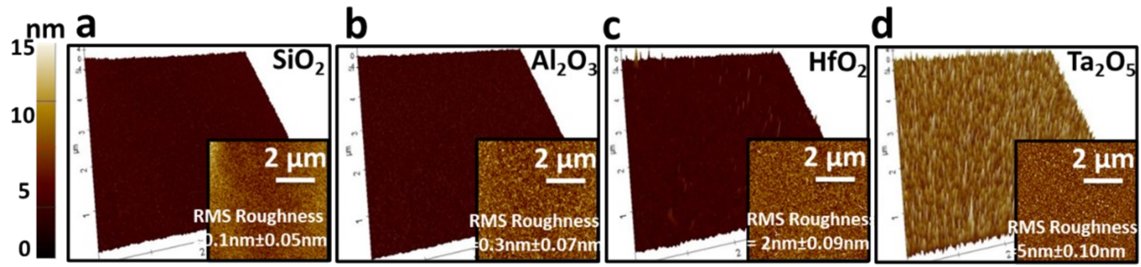


Fig S5: AFM image (a) SiO_2, (b) Al_2O_3 (c) Ta_2O_5, (d) HfO_2.

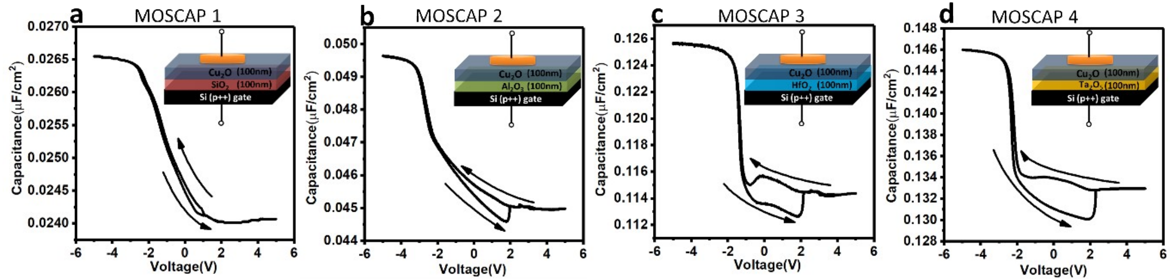


Fig S6: C–V curves for Cu_2O MOS capacitors with different dielectrics, swept from -5V to 5V with the frequency of 100 KHz to observe hysteresis of (a) MOSCAP 1 with SiO_2, (b) MOSCAP 2 with Al_2O_3, (c) MOSCAP 3 with HfO_2 and (d) MOSCAP 4 with Ta_2O_5

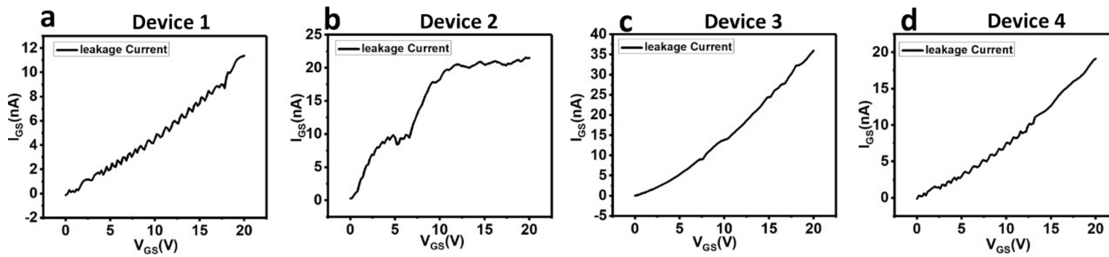


Fig S7: Gate leakage current with (a) SiO_2, (b) Al_2O_3, (c) HfO_2 and (d) Ta_2O_5

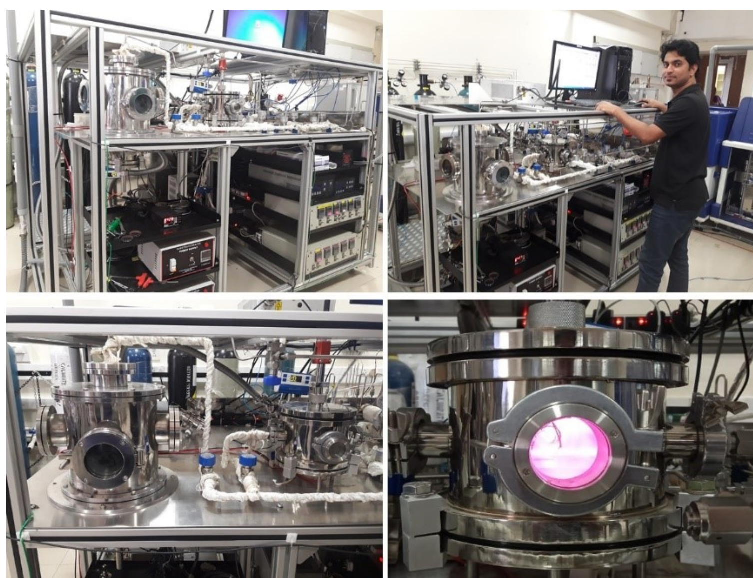


Fig S8: - CVD reactor images

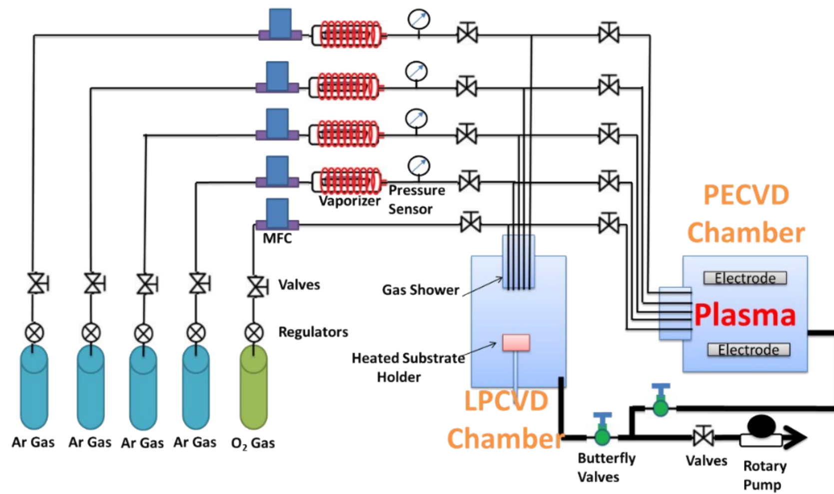


Fig S9: CVD P&ID Diagram

Substrate is highly doped p-type Si (100)
SiO2 :- Thermally grown (in Clean Room)
Al2O3 :- Deposited using ALD (in Clean Room)
Ta2O5 :- Deposited using sputtering (in Clean Room, at room temperature)
HfO2 :- Deposited using sputtering (in Clean Room, at room temperature)