

Supporting Information

Advanced Atomic Layer Deposition (ALD): Controlling Reaction Kinetics and Nucleation of Metal Thin Films Using Electric Potential Assisted ALD

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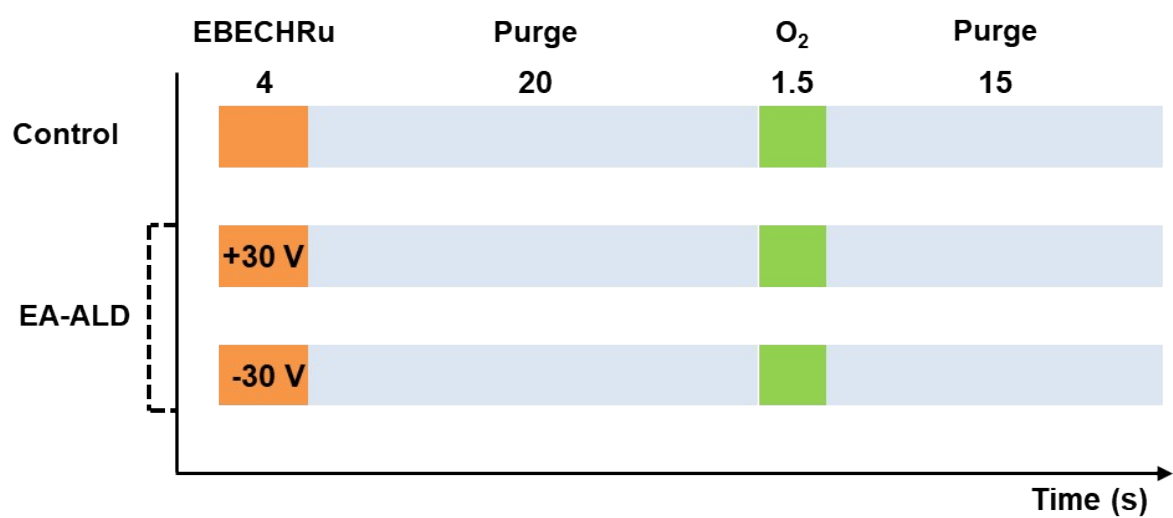


Figure S1. ALD process recipes of control ALD and EA-ALD with applied voltages of -30 V and +30 V.

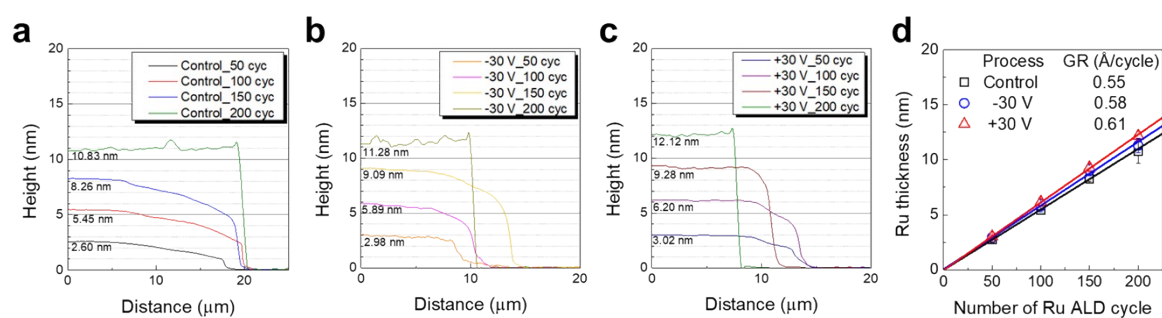


Figure S2.

AFM line profiles of patterned Ru films grown to 50, 100, 150 and 200 cycles using (a) control ALD and EA-ALD with (b) -30 V and (c) +30 V. (d) Growth rates of various Ru films.

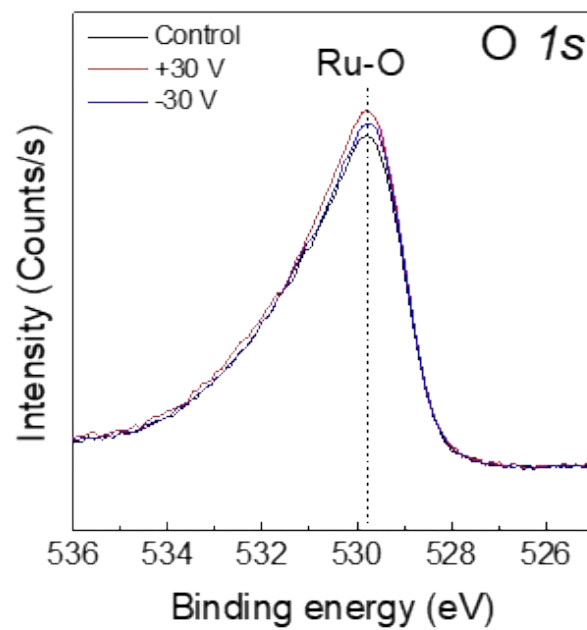
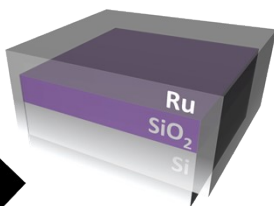


Figure S3. O 1s core level spectra of 40 nm-thick control Ru, -30 V Ru and +30 V Ru. Surface contaminant was removed by surface sputtering.

1. Substrate preparation

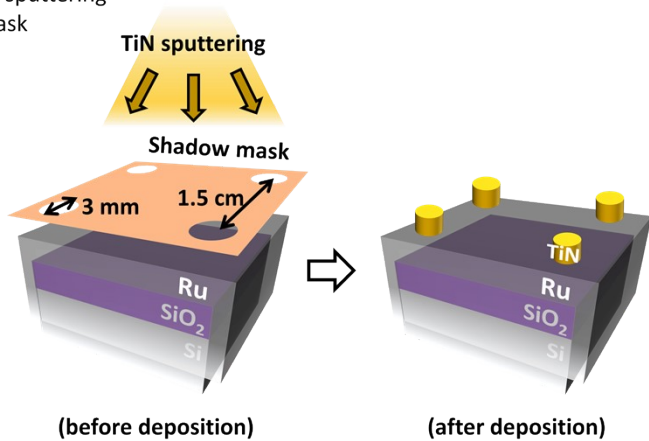


2. Ru deposition



3. TiN electrode deposition

- DC magnetron sputtering
with shadow mask



4. Ru film insulation

- cut off 4 edges of sample

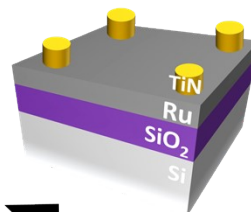


Figure S4.

Schematics of TiN electrode fabrication process for electrical measurements.