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Addition/Correction
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Correction to Atomic Layer Deposition of Ruthenium and Ruthenium Oxide Using a Zero Oxidation State Precursor

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Due to a faulty thermocouple within the atomic layer deposition (ALD) chamber, all ALD temperatures reported in the manuscript are higher than the actual temperatures used by a nonconstant amount ranging from ~25 °C for the lowest temperatures to ~40 °C for the highest temperatures used.

The corrected figures and tables with temperatures are below:

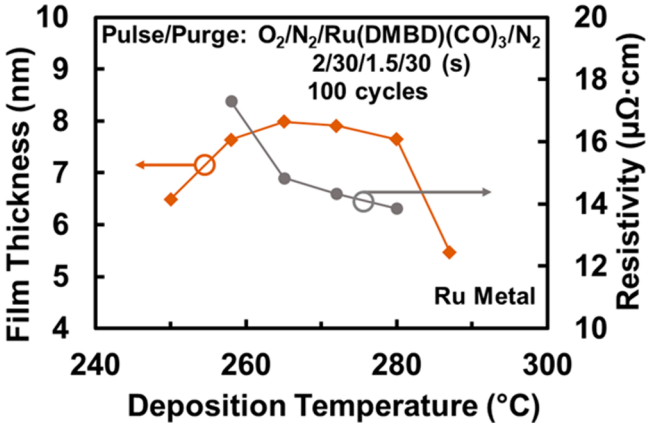

Figure 2. ALD Ru metal-film thickness and resistivity vs deposition temperature.

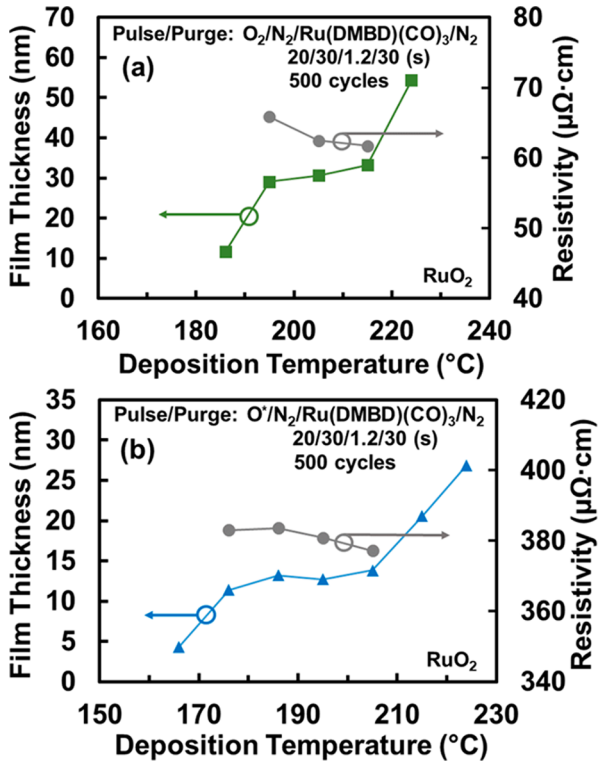

Figure 8. RuO_2-film thickness and resistivity vs deposition temperature for (a) thermal ALD and (b) PEALD.

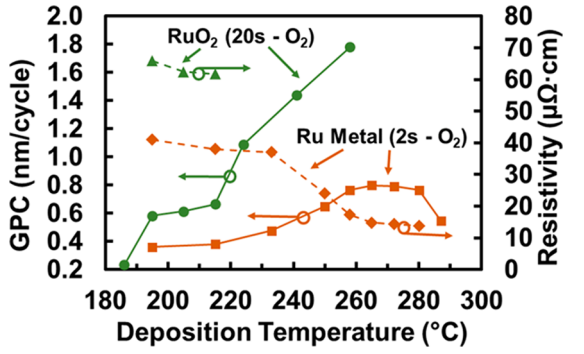

Figure 14. Comparison of GPC and resistivity vs temperature for Ru and RuO_2 thermal ALD processes. The 20 s O_2 pulses in green circles

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Table 1. Comparison of Ruthenium Precursors for Thermal ALD Ru Processes Using O_2 as a Co-Reactant

precursor	metal oxidation state	nucleation (no. of cycles)	growth rate (nm/cycle)	ALD window (°C)	resistivity ($\mu\Omega$ cm)	refs
$Ru(thd)_3$	+3	~250	0.036	325−450	15−20	17
$Ru(EtCp)_2$	+2	~210[13]	0.049[13]	uncertain[7]	15[13]	6−9, 12, 13
$Ru(Cp)_2$	+2	~250[16]	0.045[16]	325−375[16]	13[16]	16, 18
ECPR	+2	~25[20]	0.09[20]	uncertain[20]	22−26[20]	19, 20
DMPR	+2	~60	0.022	250−320	18−24	21
Cyprus	+2	~20	0.05	250−310	20	22
$Ru(DMPD)_2$	+2	~40[23]	0.012[23]	185−210[23]	17[24]	23, 24
$Ru(Cp)(CO)_2Et$	+2	~85[25]	0.1[25]	300−325[26]	16[25]	25, 26
$(HD)^iPrMePhRu$	0	3	0.076	270−350	29−36	28
IMBCHDRu	0	~10[29]	0.089[29]	225−270[29]	30−40[29]	29, 30
EBCHDRu	0	3	0.1	200−275	18	31
EBECHDRu	0	3	0.042	175−275	20	32
EBBDRu	0	15	0.056	not available	26	33
$Ru(DMBD)(CO)_3$	0	~0	0.067	255−280	14	this work

Table 2. Comparison of Ruthenium Precursors for RuO_2

precursor	metal oxidation	nucleation (cycles)	growth rate (nm/cycle)	ALD window (°C)	resistivity ($\mu\Omega$ cm)	refs
$Ru(EtCp)_2$	+2	~700[6]	0.175[9]	not available	70[9]	6, 8, 9
$Ru(Cp)_2$	+2	not available	0.32	not available	270	18
$Ru(DMPD)_2$	+2	~125	0.023	not available	not available	23
$(HD)^iPrMePhRu$	0	−50	0.15	180−200	275	28
EBCHDRu	0	2	0.186	not available	118	34
EBBDRu	0	6	0.09	not available	~140	33
$Ru(DMBD)(CO)_3$	0	35	0.065	195−215	62	this work

(GPC) and green triangles (resistivity) and 2 s O_2 pulses in orange squares (GPC) and orange diamonds (resistivity).

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