Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Precursor-based Designs of Nano-Structures and Their Processing for Co(W) Alloy Films as a Single Layered Barrier/Liner Layer in Future Cu-Interconnect

Table S1 Annealing durations for barrier evaluation.

		400 °C	500 °C	600 °C
CVD-Co/Cu	Carbonyl	5 min	5 min	5 min
CVD-Co(W) (W:7%) /Cu	Carbonyl	125 min	125 min	5 min
CVD-Co(W) (W:14%) /Cu	Carbonyl	3000 min	500 min	125 min
ALD-Co(W) (W:7%) /Cu	Amidinato	1500 min	300 min	50 min
ALD-Co(W) (W:14%) /Cu	Amidinato	1500 min	300 min	50 min
ALD-Co/Cu	Metallocene	5 min	5 min	5 min
ALD-Co(W) (W:7%) /Cu seq. I	Metallocene	3000 min	300 min	50 min
ALD-Co(W) (W:7%) /Cu seq. II	Metallocene	750 min	125 min	5 min
ALD-Co(W) (W:14%) /Cu seq. III	Metallocene	14400 min	720 min	60 min
CVD or ALD-Co/Cu	Amidinato	90 min	20 min	4 min
CVD-Co(W) (W:7%) /Cu	Amidinato	3000 min	300 min	50 min
CVD-Co(W) (W:14%) /Cu	Amidinato	4200 min	300 min	50 min
ALD-Co(W) (W:7%) /Cu	Amidinato	2700 min	720 min	180 min
ALD-Co(W) (W:14%) /Cu	Amidinato	7500 min	720 min	180 min

Table S2 Pre-exponential factors and activation energies of Cu diffusion into Co, Co(W), TaN, and W films.

Sample	Pre-exponential factor [cm^2/s]	Activation energy [eV]
CVD-Co, carbonyl	$6x10^{-3}$	1.1
CVD-Co(W), W:7%, carbonyl	$2x10^{-5}$	1.2
CVD-Co(W), W:14%, carbonyl	$1x10^{-6}$	1.4
ALD-Co, carbonyl	$1x10^{-8}$	1.1
ALD-Co(W), W:7%, carbonyl	$2x10^{-8}$	1.4
ALD-Co(W), W:14%, carbonyl	$2x10^{-9}$	1.4
ALD-Co, metallocene	$3x10^{-7}$	1.3
ALD-Co(W), W:7%, sequence I, metallocene	$1x10^{-7}$	1.6
ALD-Co(W), W:7%, sequence II, metallocene	$1x10^{-5}$	1.9
ALD-Co(W), W:14%, sequence III, metallocene	$1x10^{-7}$	1.8
CVD-Co, Amidinato	$2x10^{-9}$	1.0
CVD-Co(W), W:7%, Amidinato	$3x10^{-8}$	1.5
CVD-Co(W), W:14%, Amidinato	$1x10^{-6}$	1.5
ALD-Co, Amidinato	$4x10^{-10}$	1.0
ALD-Co(W), W:7%, Amidinato	$4x10^{-5}$	1.8
ALD-Co(W), W:14%, Amidinato	$3x10^{-7}$	1.7
PVD-TaN		1.3
CVD-W, WF_6		0.64