



Partial List of GEMStar ALD Processes

	Precursor 1	Precursor 2	Temperature (°C)
<u>Oxides</u>			
Al ₂ O ₃	TMA	water	50 - 400
Al ₂ O ₃	TMA	ozone	50 - 300
Al ₂ O ₃	TMA	oxygen plasma	50 - 300
Fe ₂ O ₃ *	Fe ₂ (tBuO) ₆	water	130 - 160
HfO ₂	TDMAHf	water	100 - 275
In ₂ O ₃	TMIIn	water	200 - 250
MgO	Mg AMD	water	200 - 275
MgO	Mg (EtCp) ₂	water	130 - 275
SiO ₂	SAM24	ozone	80 - 300
SiO ₂	trimethylaluminum	t-butoxysilanol	75 - 250
SnO ₂	TDMASn	hydrogen peroxide	100 - 200
SnO ₂	Tin Cyclic Stannylene	hydrogen peroxide	50 - 200
Ta ₂ O ₅	TBTDET	water	100 - 350
TiO ₂	TDMATi	ozone	125 - 225
TiO ₂	TDMATi	water	125 - 225
TiO ₂	TDMATi	oxygen plasma	100 - 200
TiO ₂ *	Titanium isopropoxide	water	150 - 250
V ₂ O ₅ *	Vanadium tri-i-prppoxy oxide	water	90 - 160
Y ₂ O ₃	YAMD	water	150 - 280
Y ₂ O ₃	Y(MeCp) ₃	water	200 - 280
ZnO	DEZ	water	50 - 200
ZrO ₂	TDMAZr	water	100 - 250
ZrO ₂	Zr FAMD	water	220 - 300
YSZ	Y(MeCp) ₃ /TDMAZr	water	200
<u>Metals</u>			
Pt	Pt(MeCp)Me ₃	O ₂	200 - 300
Ni*	NiAMD	NH ₃ /H ₂	160 - 220
Pd*	Pd(hafc) ₂	formalin	200
Ir*	Ir(acac) ₃	O ₂	200 - 300
Ru*	Ru(EtCp) ₂	O ₂	200 - 300
<u>Nitrides</u>			
WN _x	Tunstenbisimidobisamido	NH ₃	300 - 400
TiN	TDMATi	NH ₃ plasma	100 - 200
TiN*	TDMATi	NH ₃	250 - 300
NiN _x *	NiAMD	NH ₃ /H ₂	160 - 220
<u>Sulfides</u>			
ZnS*	Diethylzinc	H ₂ S	175 - 275
MoS ₂ *	MoCp ₂ Cl ₂	H ₂ S	200 - 400
<u>Nanolaminates</u>			
Several different combinations of multiple ALD layers			

* Customer Processes