THIN FILM PVD TECHNOLOGIES - OVERVIEW

PROCESS	MATERIAL	Yield UNIFORMITY	Film Quality IMPURITY	Film Quality FILM QUALITY Density & Adhesion, Stress	Throughput DEP RATE	TEMPERATURE	DIRECTIONALITY	Throughput SCALABILITY	Capex COST / COMPLEXITY
THERMAL RESISTIVE EVAPORATION	Low melting point Typically Metals	Poor Excellent w/ planetary & masks	High	Poor Improved w/ Ion Assist Moderate Stress	< 50 Å/s	50 – 100 °C	Good	Limited @ reduced utilization and dep rate	Very low
E-BEAM EVAPORATION	Metals & Dielectrics	Poor Excellent w/ planetary & masks	Low	Poor Improved w/ Ion a Moderate Stress	< 100 Å/s	50 – 100 °C	Good	Limited @ reduced utilization and dep rate	Moderate/ Moderate complexity
MAGNETRON SPUTTERING	Metals & Dielectrics	Good Improvement difficult & costly	Low	Very Good Moderate to High Stress	Metals: < 100 Å/s Dielectrics: 1 – 10 Å/s	200 °C Typically requires cooling	Low Improved w/ system geometry	High w/ automation	High / Moderate complexity
INVERTED CYLINDRICAL MAGNETRON SPUTTERING	Metals & Dielectrics	Excellent	Low	Very Good Moderate to High Stress	Metals: < 100 A/s Dielectrics: 1 – 10 Å/s	200 °C Typically requires cooling	Omnidirectional for 3D coatings	High w/ automation	High / Moderate complexity
ION BEAM SPUTTERING	Metals & Dielectrics	Excellent	Very Low	Excellent High Stress	1 – 2 Å/s	Low	Excellent Controlled	Low	Very High cost & complexity
BIASED TARGET ION BEAM SPUTTERING	Metals & Dielectrics	Excellent	Best	Excellent High Stress	1 – 2 Å/s	Low	Excellent Controlled	Low	Very High cost & complexity

TECHNOLOGY SELECTION CONSIDERATIONS

● Capex ● Yield ● Throughput ● Film Quality

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