SPTS
A KLA Company

APPLICATION
BRIEF

MVD® Anti-stiction Coating for MEMS

Introduction

Molecular Vapor Deposition (MVD®) is a unique process technology that deposits ultra-thin films by vapor deposition at low temperatures on a broad spectrum of substrates. The process was invented to help semiconductor manufacturers grow ultra-thin, functionalized, organic and inorganic films with higher yields and better cost efficiencies than traditional liquid deposition techniques. Such films serve as lubricant, protective, hydrophobic, hydrophilic, biocompatible, or reactive coatings. In MEMS applications, for example, MVD® films are typically used as anti-stiction coatings to improve device performance, and enhance overall device lifetime.

MVD® platforms allow for the use of up to four precursors, and can process multiple wafers or other three-dimensional objects in a single batch.

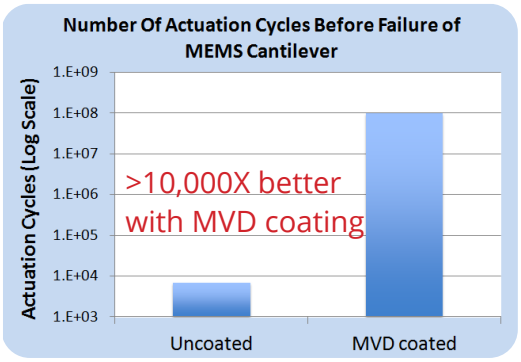
Benefits of MVD® for MEMS

Improved Device Reliability

With MVD®, manufacturers can achieve exceptional film uniformity with industry-leading reliability — advantages that maximize manufacturing yields and reduce overall costs. Device performance is also greatly improved, especially in many MEMS applications. For example, with MVD-deposited anti-stiction films, failure rates for microphones shrank from 14 percent to 0.4 percent, while the failure rate for accelerometers dropped from 40 percent to less than 5 percent.

Superior Films for MEMS Process Challenges

SPTS has developed a multitude of both organic and inorganic films, which when used singly or as multilayer laminates provide wide ranging solutions for the diverse process requirements in MEMS manufacturing. Issues such as thermal stability during higher temperature wafer bonding, water contact or oil contact



Improvement in MEMS device lifetime with MVD anti-stiction coating

angle, film durability and adhesion to substrates utilizing diverse materials can be traded off and optimized by choosing the right chemistry for the challenges of a particular MEMS device.

Superior Process Capability

MVD® systems are highly flexible and can run both ALD-like (different precursor reaction cycles, separated with purge) and CVD-like (precursors mixed together in the chamber) processes. The platforms feature optional integrated plasma generation for substrate conditioning.

Operating in the vapor phase, MVD® is a superior alternative to traditional liquid-based methods for growing ultra-thin protective films. MVD® delivers extremely high conformality on aggressive aspect ratios of up to 2000:1.

With feature sizes shrinking faster than the pace of progress for conventional deposition tools, MVD® presents a completely new approach. Unburdened by legacy technologies, the platform has been engineered by our team of thin-film deposition experts and built specifically to meet the aggressive performance specs for today's advanced devices.

continued overleaf...

Flexible, Low CoO Operation

The MVD® platform is versatile, easy-to-use and highly scalable. In addition, the learning curve is light, which is a benefit valued by customers who deploy the system for multiple applications. The ultra-low cost-of-ownership is due to the tool's inherent efficiencies, and is further enabled by its very low precursor consumption. Also, by consuming only milligram levels of precursor per run, and requiring nearly zero point-of-use exhaust treatment, it's greener than most CVD deposition techniques.

Other (non-MEMS) Applications

Beyond MEMS, other important applications benefit from MVD®. In advanced packaging applications for example, MVD® films are used as moisture barriers for polymers, as well as oxidation and corrosion barriers on metals. In inkjet applications, MVD® films can prevent ink accumulation on the nozzle face plate to optimize ink flow. In bio-MEMS, MVD® films improve wetting and/or prevent protein adsorption. In biotechnology applications, MVD® films are used to create surface anchors for biomolecule reactions. In nano-imprint lithography, MVD® films are used as very thin and conformal release layers between the stamp and polymer materials.

Platform Options

MVD100E

The MVD100E is the designated tool for R&D or pilot manufacturing for single wafers or small batches , with a low volume chamber for fast processing. It is designed for high performance, flexibility and reliability for the most demanding applications. It can process 200mm wafers or components on trays using up to 4 precursors.

MVD100E

MVD300/300L/300E

The MVD300, MVD300L with a load port, and MVD300E with an EFEM, are designed for high performance, flexibility and reliability for the most demanding high volume manufacturing applications. They provide a range of handling options for 200mm or 300mm wafers, singulated die on tape frames, or components on trays. Up to 4 precursors can be utilized.

MVD300E

MVD300

MVD300L

SPTS Technologies, a KLA company, designs, manufactures, sells, and supports etch, PVD, CVD and MVD® wafer processing solutions for the MEMS and sensors, advanced packaging, photonics, high speed RF, and power device markets. For more information, email enquiries@spts.com or visit www.spts.com