

# Combinatorial Sputter Deposition Systems

## Combinatorial Sputter Deposition Systems

Grows multiple combinatorial thin film test pads on substrates up to 150 mm in diameter. Includes six magnetrons, power supplies, programmable X-Y stage and mask assembly. Ideal for creating reproducible combinatorial libraries of new material compositions quickly.

PVD Products provides unique combinatorial sputter deposition systems for the creation of new thin film material compositions. These systems provide individual test pads with uniform composition throughout, allowing for critical measurements. Systems can handle wafer sizes from 50 mm to over 300 mm, as well as square substrates.

Systems can include up to six magnetron sputter sources with either 1.5" or 2" diameter targets, with RF, DC, and pulsed DC capability. A wide variety of MFC's, single or multi wafer load locks can be included. Magnetrons can be mounted on Z-stages to provide a wide range of deposition rates. Test pad sizes can range from about 4 mm to over 25 mm based on requirements, easily changeable and repeatable with software in the field.

Sputtering systems include a quartz crystal microbalance on a Z-stage to provide calibration of each source under a wide variety of deposition conditions, including: chamber gas composition, pressure, and flow rates, power supply power, target-to-substrate distance. All system data is stored in easily accessed look-up tables.



### Combinatorial Sputter System Interior

300 mm diameter combinatorial sputter system with four magnetrons, a metal mask on a programmable vacuum-compatible stage. Each magnetron is mounted on a Z-stage to finely adjust target-to-substrate distance.

Deposition recipes can easily be written for a single array or multiple arrays when load locks are used. All systems are fully computer controlled and provide complete data logging of all relevant deposition parameters.

PVD's combinatorial sputter systems provide users with a wide range of capabilities for the growth of new materials. Our equipment will quickly help the customer determine the proper composition needed for specific applications, saving significant time and money individually testing 100's of unique compositions.

Systems come complete with all necessary components such as power distribution boxes, power supplies, MFCs, water flow interlock switches, pneumatic valves, closed-loop feedback for constant pressure control, various pumping packages, full featured Lab VIEW™ software. Each machine can be individually tailored for the customer's specific requirements.

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## Combinatorial System Options

Compositions can be binary, ternary, or quaternary depending on your needs and system design

Concentrations of elements can vary from less than 1 to over 99% depending on materials and deposition conditions

Magnetrons can run in RF or DC mode with proper switches

In-vacuum four point probe measurements, other analytical techniques possible

Localized heating of deposition zone

Localized RF bias for oxide and nitride growth

Custom systems fabricated to required specs available

### Figure 1

The materials used in depositing the 64 test combinatorial test pads were Cu, Ti, V, and Al.

Oxides, nitrides, carbides, etc. can also be deposited as required.

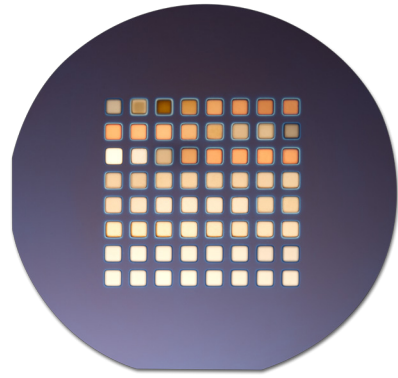
### Graph 1

The composition obtained from one column of the wafer shown in Figure 1. Data was obtained using a Thermo Scientific K-Alpha XPS system.

### Figure 2

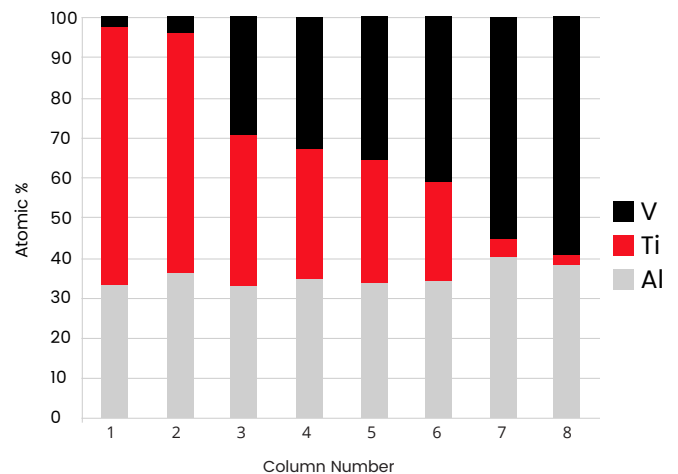
Quick electrical evaluation of each test pad composition's electrical properties can be obtained by depositing underlying test circuits as shown.

For this wafer each test pad was capped with a metallic layer post combinatorial-deposition to form the final device for electrical testing purposes.

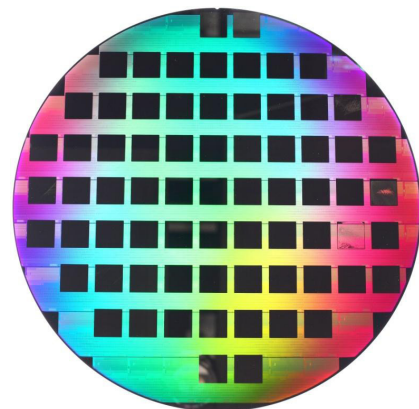


**Figure 1: 100 mm Diameter Si Wafer**

Array of 64 test pads each 4 mm sq. with a different composition



**Graph 1: XPS Data from One Column of Wafer**



**Figure 2: 300 mm Diameter Wafer**

68 test pads deposited over pre-patterned underlying circuits

## PVD Products

Fueled by creative problem-solving, our team of experienced engineers and technicians is passionate about finding the best solution to your unique deposition system demands. We provide end-to-end support, from design through installation and continuing maintenance.

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