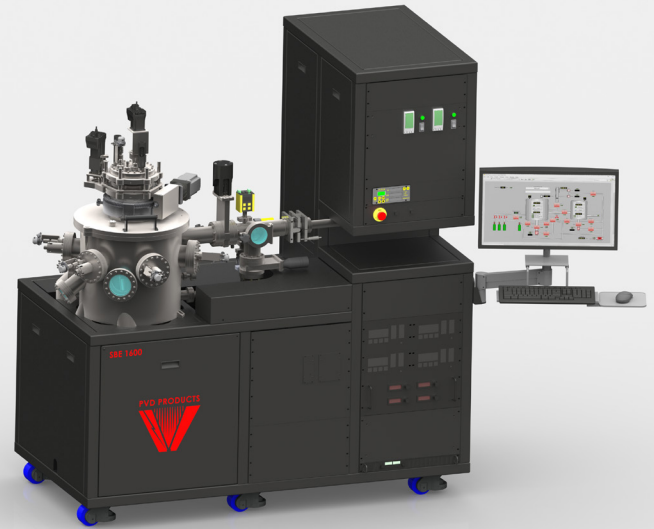


SBE-2600 System

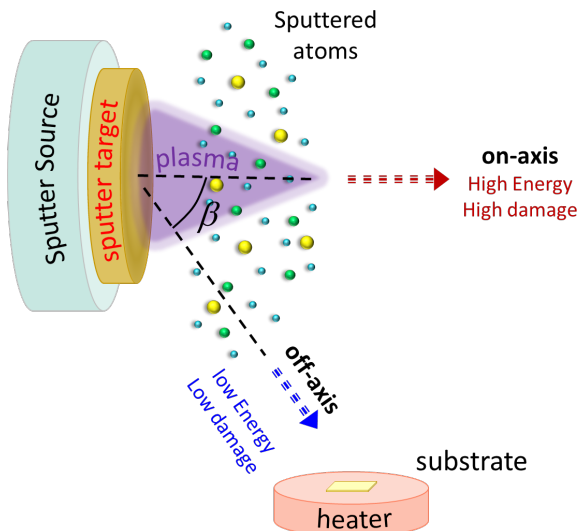


PVD Products provides innovative off-axis sputtering systems for the growth of epitaxial thin films. This low-cost, versatile system produces films of quality rivaling MBE and PLD. At the same time, it offers the simplicity of operation as any other magnetron sputtering tool. The innovation arises from patent-pending off-axis geometry which uses unique low-pressure conditions and (optional) pressed powder targets to achieve single-crystal growth and accurate film stoichiometry.

The system can include up to six off-axis magnetron guns and three confocal magnetron guns for doing standard sputter deposition. The 2" guns can be swapped between these two orientations for maximum flexibility. Power supplies for DC and RF deposition are available. Substrate sizes up to 1" square can be utilized. The process gas delivery system is designed to allow a wide range of oxygen partial pressures for the ideal growth of oxides. The available UHV option allows deposition of high purity metallic layers.

### Off-Axis Sputtering Geometry

By capturing the lower energy off-axis emitted atoms, an epitaxial film can be formed. In addition, the use of pressed powder targets homogenizes the composition of the film across the substrate.



While the technology is innovative, the results are proven. The method, developed at The Ohio State University, has been utilized successfully for almost ten years. It has provided crystalline epitaxial films of a variety of materials, including perovskite oxides, magnetic garnets, intermetallic compounds, and other materials. Over 40 articles have been published, many in high impact journals, verifying the quality of the films and supporting fundamental discoveries.

Deposition recipes can easily be written to control complex recipes for automated film growth, ensuring consistency of results. Recipes support growth of multilayers and can also combine off-axis and confocal sputtering in the same run to maximize efficiency. The integrated load lock provides quick sample turnaround, so the user can spend more time exploring properties and less time making samples.

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, high quality pumping packages, and full featured Lab VIEW™ software.

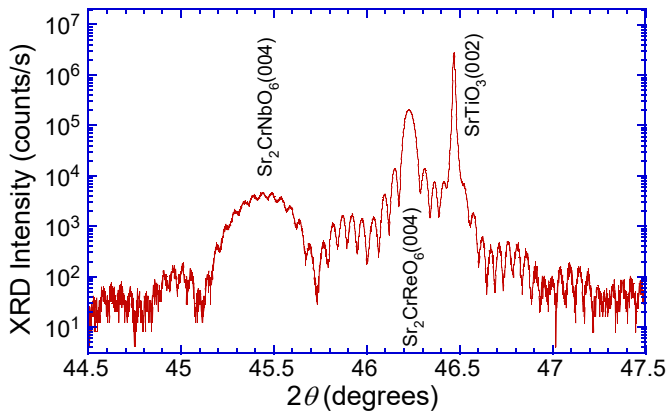
# Off-Axis Sputtering Deposition Systems

## System Capabilities and Options

- Two to six off-axis magnetrons
- Up to three confocal magnetrons
- Up to four magnetron power supplies (per system)
- High Vacuum ( $< 5 \times 10^{-8}$  Torr) or Ultrahigh Vacuum ( $< 5 \times 10^{-9}$  Torr)
- Argon and oxygen process gases, with oxygen concentration ranging from 0.1% to 10%
- Holders for samples up to 1" square
- Substrate heating to 650°C
- Substrate rotation 0-30 RPM
- Small-volume load lock
- Optional pressed powder targets

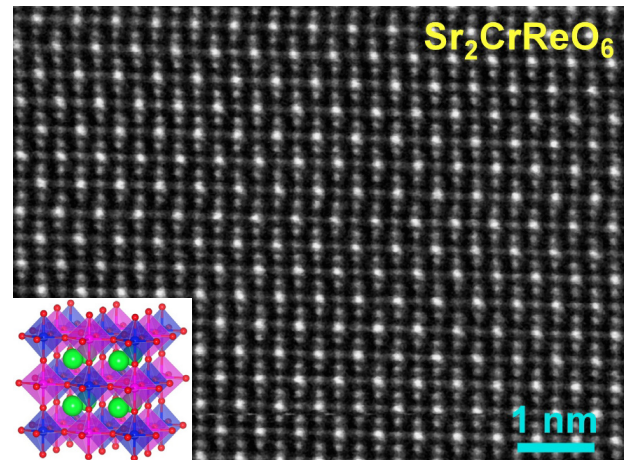
### Smooth, Low Defect Films

Semi-log  $2\theta - \omega$  scan of a bi-layer consisting of two double perovskite  $A_2BB'O_6$  films near the  $SrTiO_3$  (002) peak, which exhibits clear Laue oscillations, confirming the high degree of structural order.



### Precise Atomic Order

STEM image of double perovskite film deposited on  $SrTiO_3$ . Off-axis sputtering creates the high degree of order for the Cr and Re sites, which is needed to obtain desirable properties in this ferrimagnetic semiconductor.



## 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.