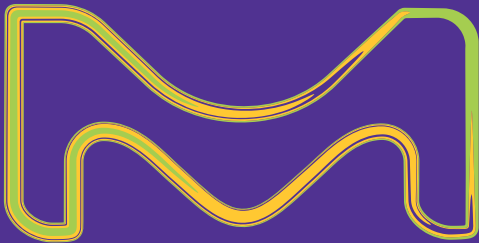


# our combined products & capabilities

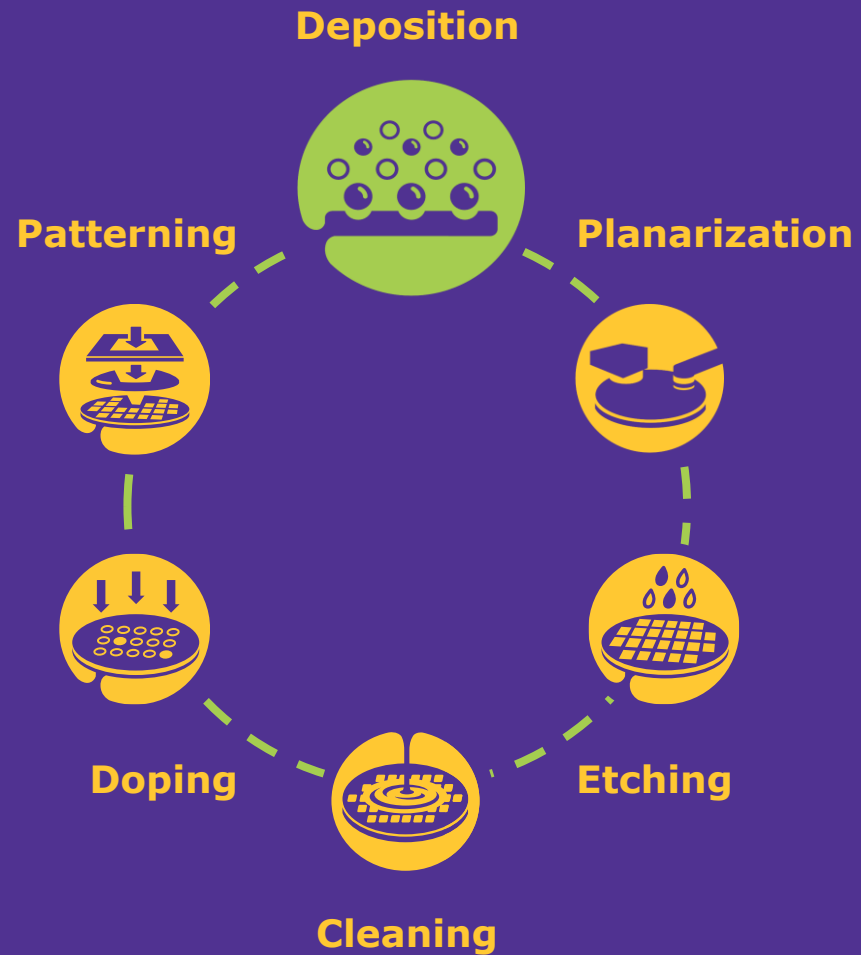
Thin Film Solutions



The performance materials business  
of Merck KGaA, Darmstadt, Germany  
operates as EMD Performance Materials  
in the U.S. and Canada.

**EMD**  
**PERFORMANCE**  
**MATERIALS**

# Our Portfolio



**Leading positions** in Thin Film solutions:

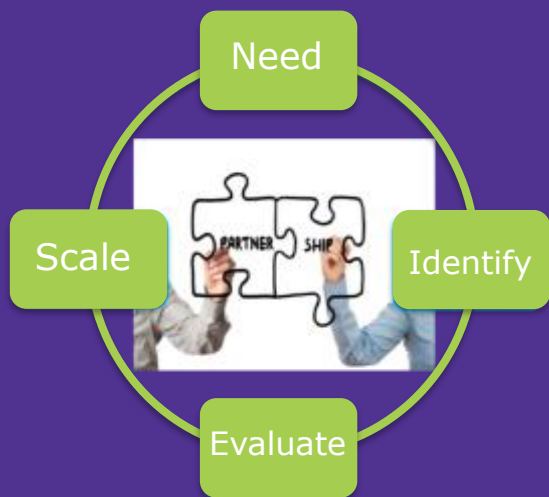
- **Spin-on Dielectrics**
- **Organosilanes**
- **Organometallics**



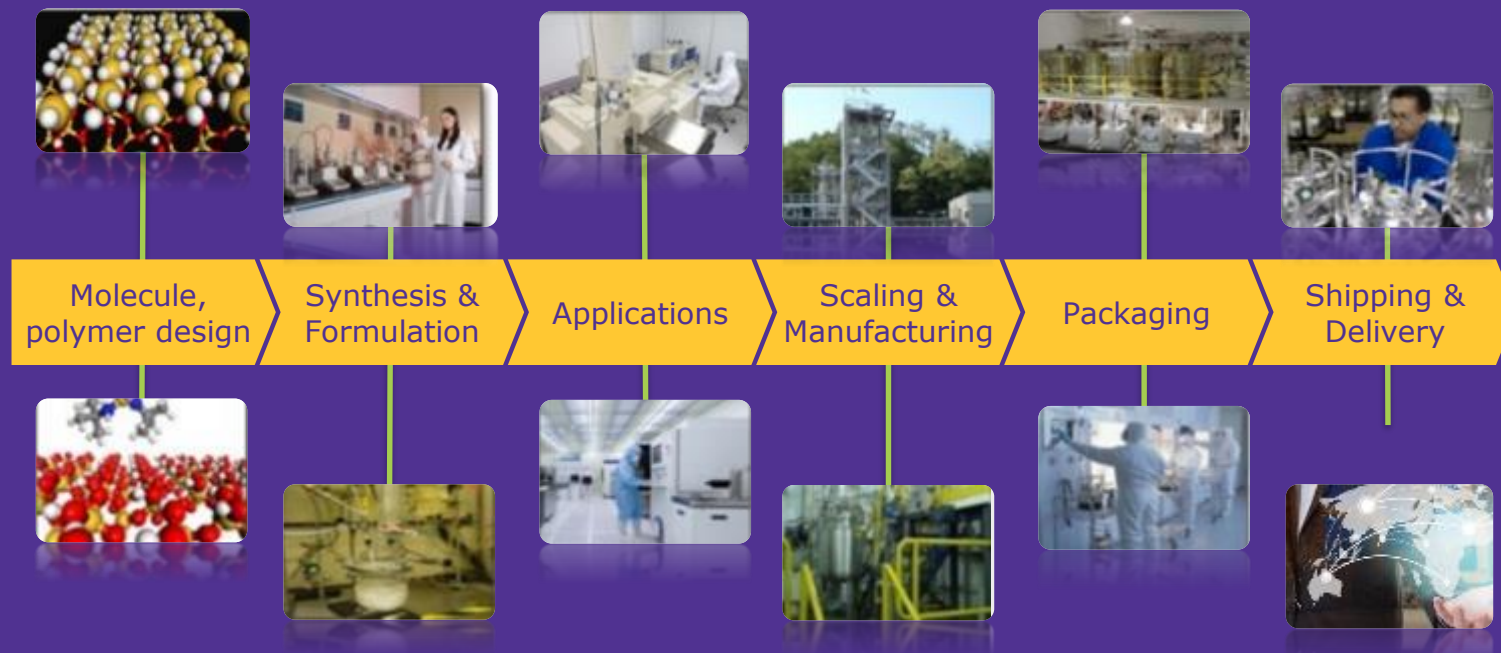
# Our approach: *close collaboration*

to enable material innovation and solve unique problems

Close collaboration...



...that drives mutually  
beneficial growth



# Application Areas

- **Gap fills:** SOD, FCVD, ALD, and CVD
- **Low-k:** BEOL and FEOL
- **3D Structures:** FinFET, 3D NAND, and Packaging
- **Conformal films** for high aspect ratio features at both low and high temperatures
- **Advanced Patterning**
- **Gate stacks/Work Function**
- **Barriers**
- **Contacts**
- **Wordline**
- **Hardmasks**
- **Selective deposition**
- **Displays**

## our offerings

### Spin-on Dielectrics

- Existing: Spinfil® and Ancillary, RS series,
- New: Spinfil® and RS series next gen, Multi-Color Materials, PSOD

### Organosilanes (PECVD, ALD, and FCVD)

- Existing: AP-LTO® and AP-LTN® product lines, PDEMS® franchise for Structure former and Porogen, BTBAS/3DMAS/TEOS/3MS/4MS/TSA
- New products: new ALD precursors; PECVD based advanced Low-k; new FCVD

### Organometallics (CVD and ALD)

- Existing: Co/Ta/Al/Ti/Hf/La/Cu
- New: Mo/W/Zr/Ru/Y/Nb
- Differentiation through containers
- Dopants and other specialty chemicals



## Technology solutions for:

- Spin-on Dielectric
- Organosilanes
- Organometallics
- Other specialty chemicals

# OUR R&D Capabilities

## Broad chemistry/thin-film science base

- Silicon based polymers
- Silicon, metal, and dopant precursors
- Organic chemistry

## Computational Modeling

- Process modeling
- Molecular modeling

## Chemical synthesis/purification

- Bench top, Kilo-scale, and Pilot capabilities
- Full engineering and scale up

## Applications testing and film metrology

- Spin-on, PECVD, and ALD deposition: 300mm and screening tools
- State-of-the-art analytical tools

## Precursor containers and delivery

- Collaboration with our internal Delivery System to solve unique problems

## Advanced materials analytical capability

## In-fab process characterization

## Access to Intermolecular capabilities



# Global capabilities & capacities

11 Manufacturing and 8 R&D Facilities

## US:

Haverhill (MA),  
Sheboygan (WI),  
Carlsbad (CA),  
Hometown (PA)  
Catoosa (OK)

Manufacturing

Haverhill (MA),  
Sheboygan (WI),  
Carlsbad (CA),  
Hometown (PA)  
Tempe (AZ)

Research &  
Development

## Korea:

Anseong,  
Sihwa,  
Banwol

Manufacturing

Banwol

Research  
&Development

## Japan:

Shizuoka

Manufacturing  
Research  
&Development

## Taiwan:

Kaohsiung,  
Nanke

Manufacturing

Kaohsiung

Research &  
Development

