

# RARE ELEMENTS:

THE HIDDEN GEMS OF

# SEMICONDUCTOR MANUFACTURING

Rare earth elements (REEs) such as cerium, europium, gadolinium, lanthanum, terbium, and yttrium play crucial roles in various aspects of semiconductor production, making them indispensable for the semiconductor industry.

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CHAHEL GUPTA

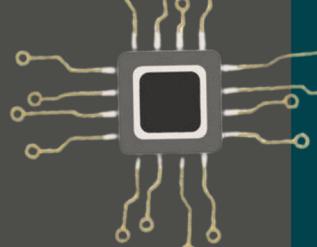
## CERIUM (CE)



Used in chemical mechanical planarization (CMP) slurries for polishing semiconductor wafers, ensuring uniform and smooth surfaces for precise circuitry.

It is used in cerium oxide-based compounds for polishing optics and lenses in semiconductor equipment, ensuring optical clarity and accuracy.

## EUROPIUM (EU)

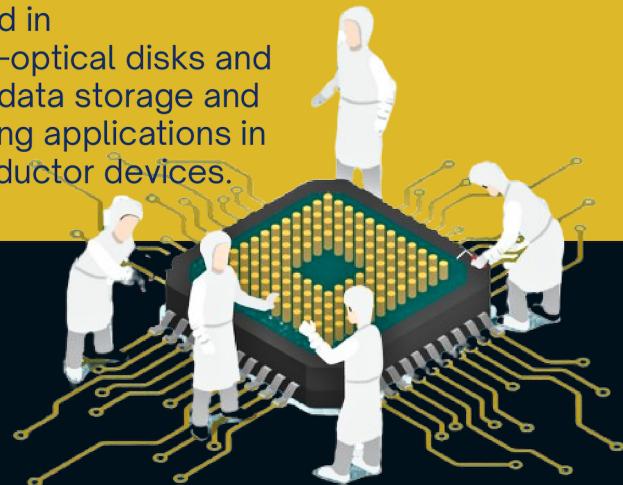


is used in red phosphors like yttrium europium oxide (YEO) for vivid red hues in LED and plasma screens, ensuring color accuracy. It's also in luminescent materials for optical sensors and lasers in semiconductor testing.

## GADOLINIUM (GD)

Used in magnetic field sensors based on gadolinium gallium garnet (GGG) crystals, enabling precise measurements and control in semiconductor fabrication equipment.

Employed in magneto-optical disks and films for data storage and processing applications in semiconductor devices.



## LANTHANUM (LA)

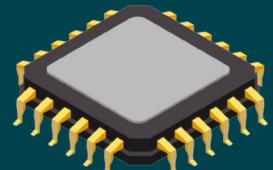
It is used in semiconductor manufacturing for energy-efficient solid oxide fuel cells (SOFCs) and as a dopant to enhance electrical conductivity in semiconductor materials, improving device performance.



## TERBIUM (TB)

Essential in green phosphors such as terbium-doped yttrium aluminum garnet (YAG:Tb) for display screens, ensuring bright and energy-efficient green light emission.

Used in magnetostrictive materials for sensors and actuators in semiconductor equipment, enabling precise mechanical control and measurement.



## YTTRIUM (Y)

Employed in yttrium iron garnet (YIG) films for microwave and radio frequency (RF) applications in semiconductor devices, including filters and resonators.

Added to yttrium oxide-based materials for gate dielectrics in semiconductor transistors, improving electrical insulation and device reliability.