Semiconductor Device Fabrication Using CMP Technology

Chemical Mechanical Planarizing Technology

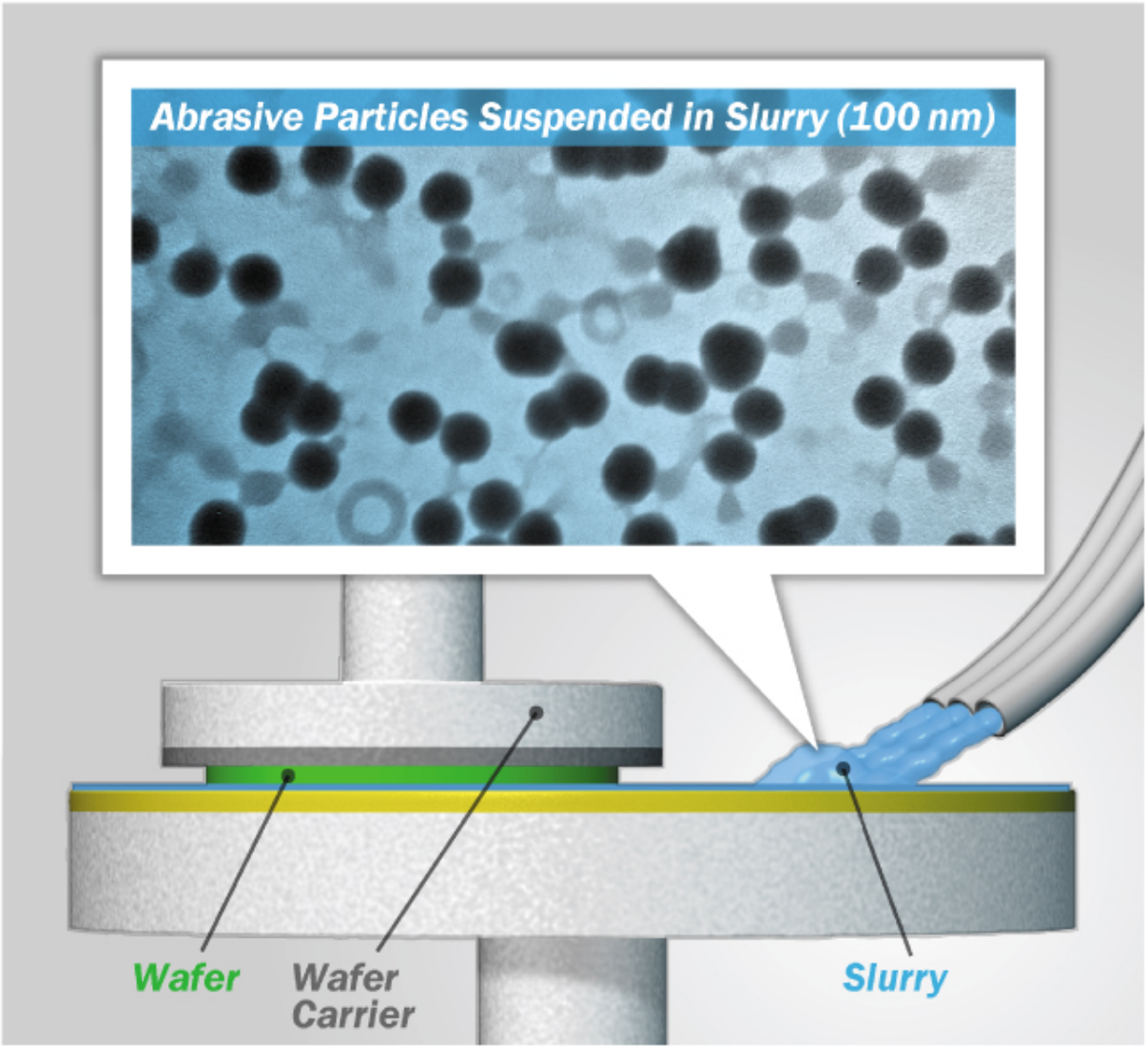
MECHANICAL

- ***Tiny, solid abrasive particles suspended in a solution*** act like liquid sandpaper to polish the wafer surface.
  - Silica (silicon dioxide or SiO_2)
  - Alumina (aluminum oxide or Al_2O_3)

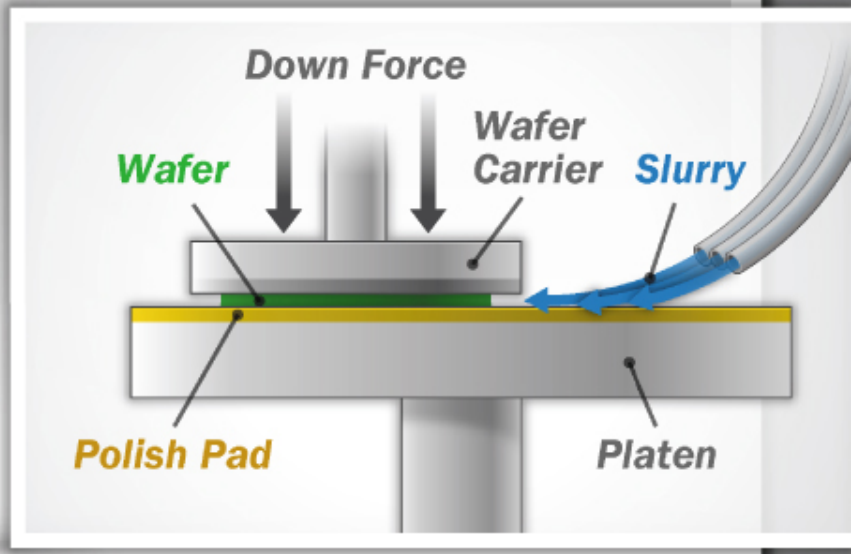
CHEMICAL

- ***Oxidizing agent*** chemically reacts with a metal layer to facilitate its removal.
- ***Catalyst*** enhances a chemical (oxidation) reaction.
- ***Stabilizer (1)*** keeps the oxidizing agent intact until ready for use.
- ***Stabilizer (2)*** keeps the abrasive particles suspended in solution until ready for use.

The "Mechanical" Component of CMP Technology



The First Dielectric Layer Is Planarized Using CMP Technology



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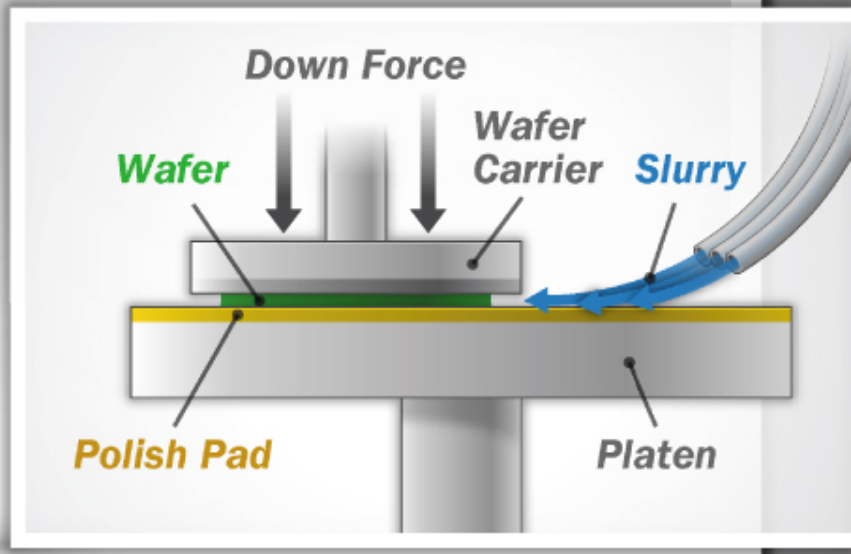
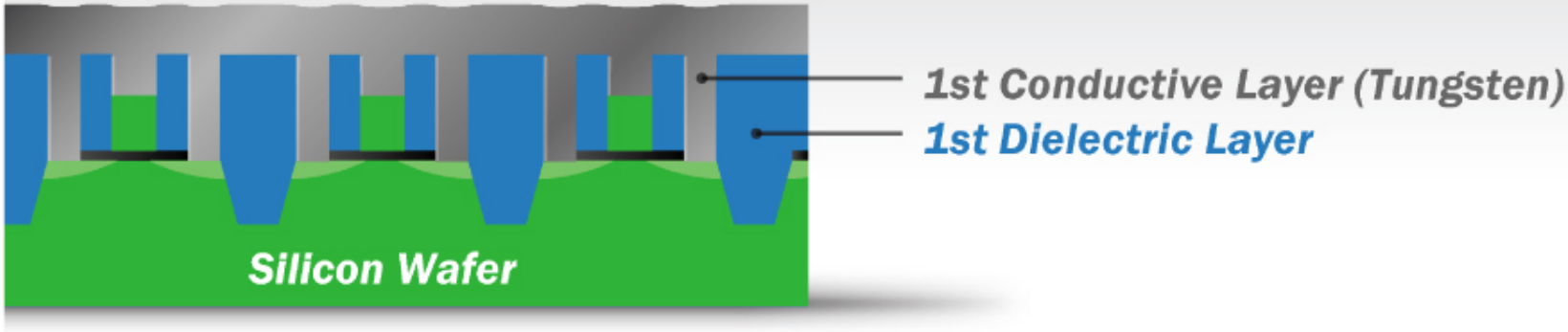


Contact Holes Are Patterned in the First Dielectric Layer

Deposition of the First Conductive Layer (Tungsten)



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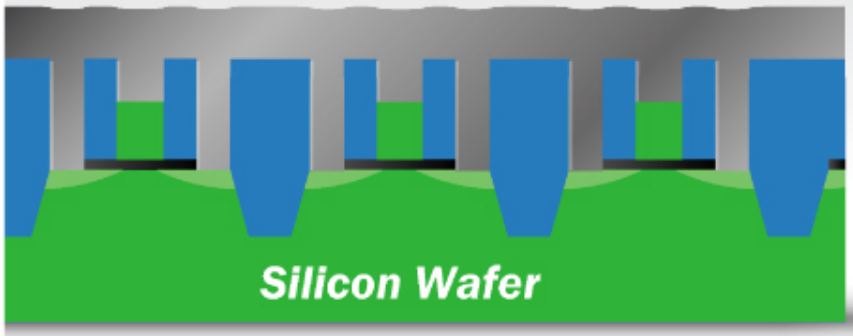

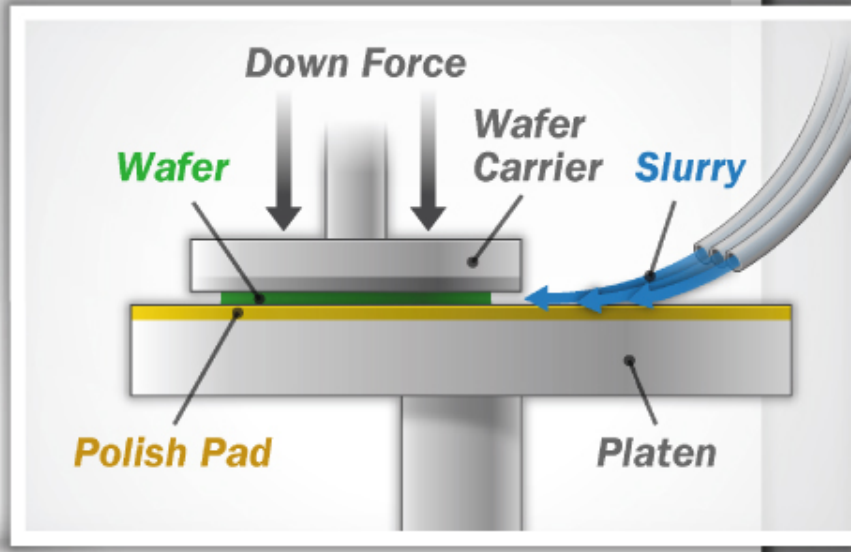

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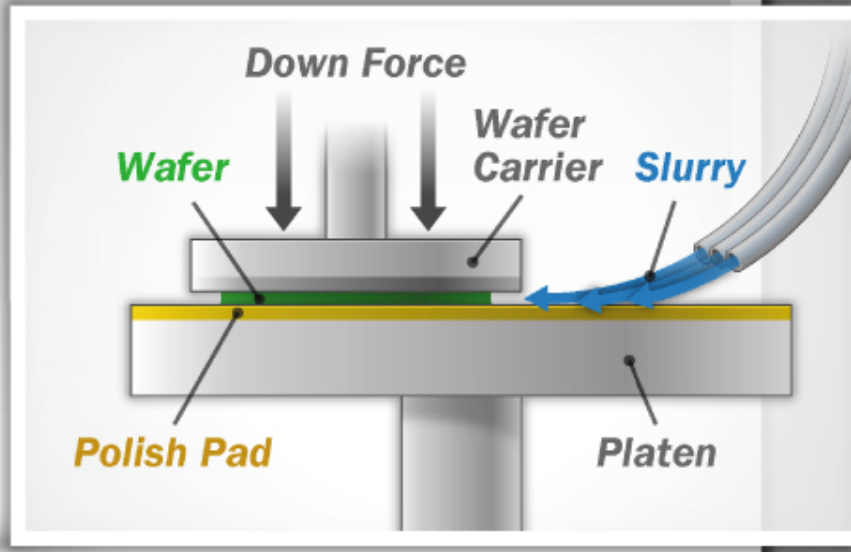
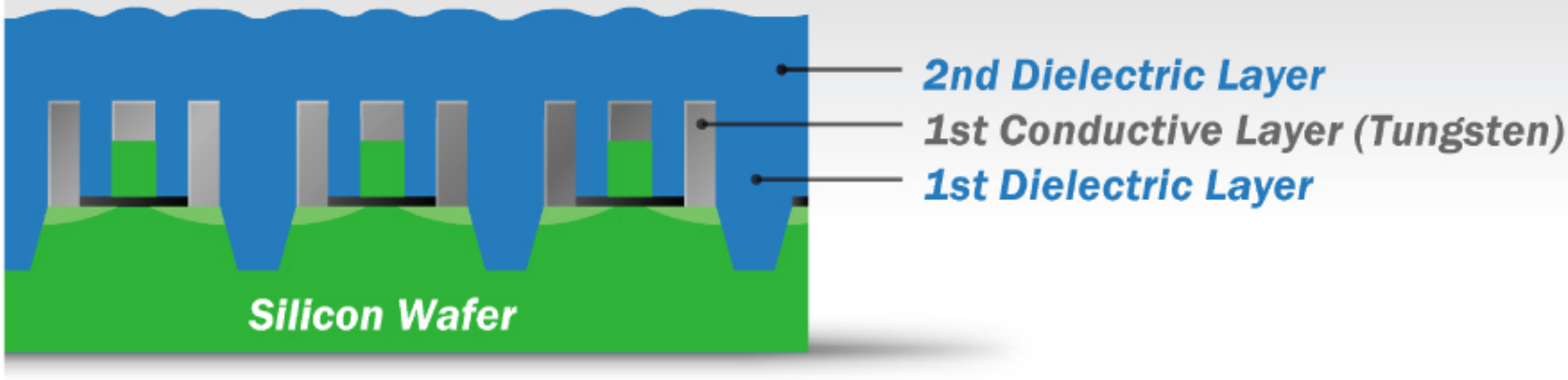


Subsequent Dielectric Layers and Conductive (Metal) Layers Are Planarized Using CMP Technology



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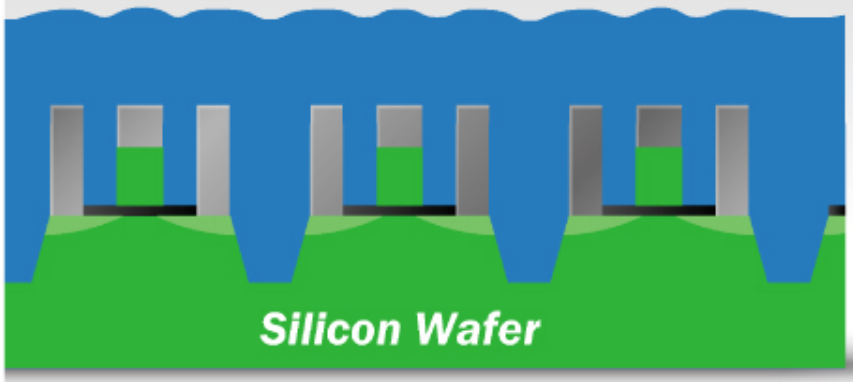

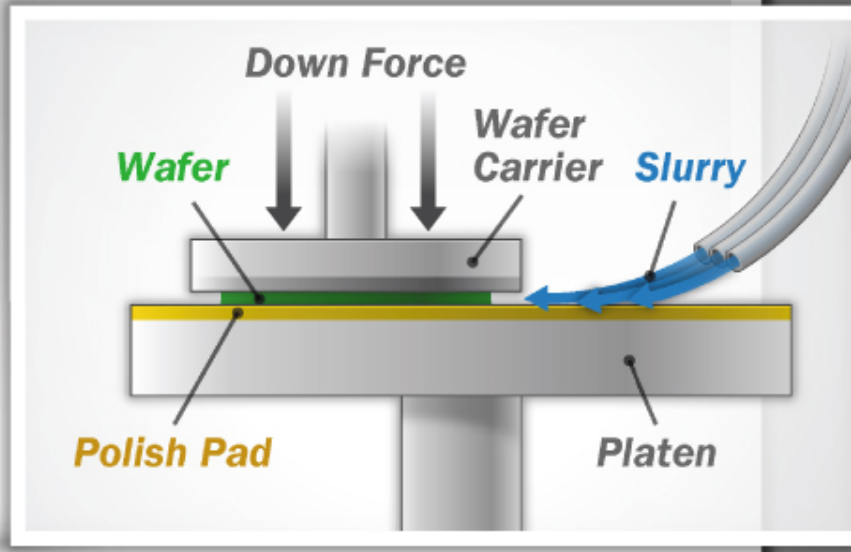

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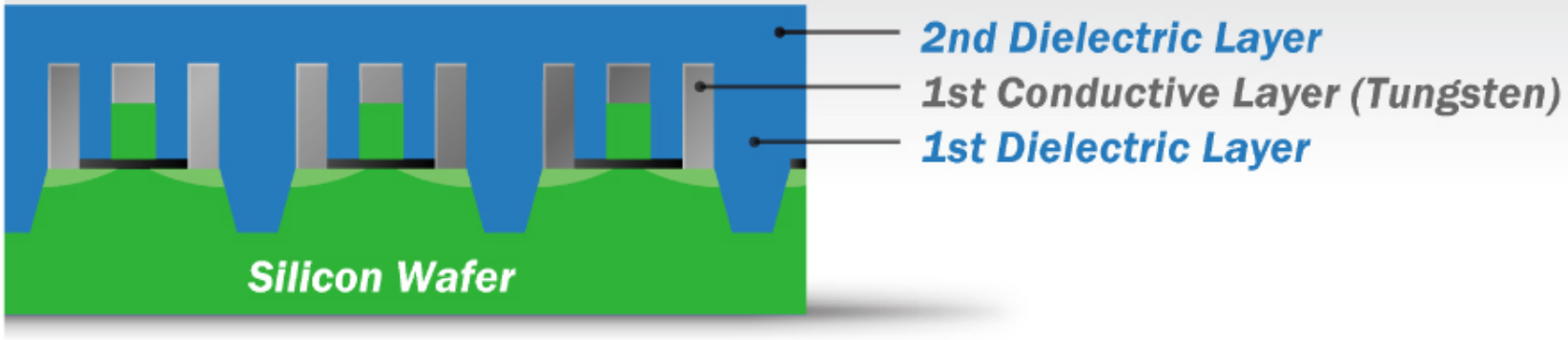

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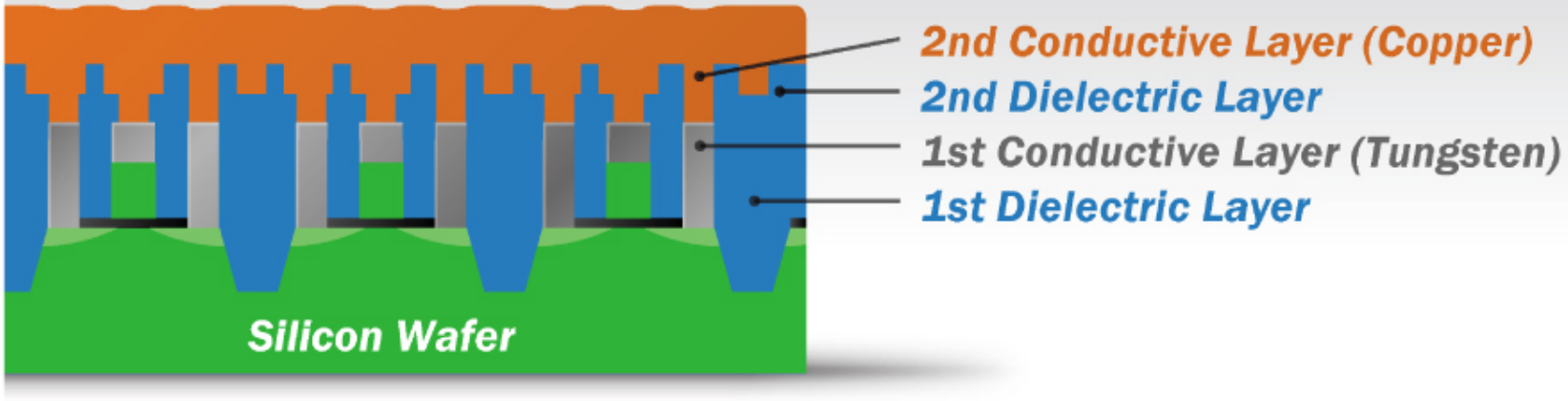

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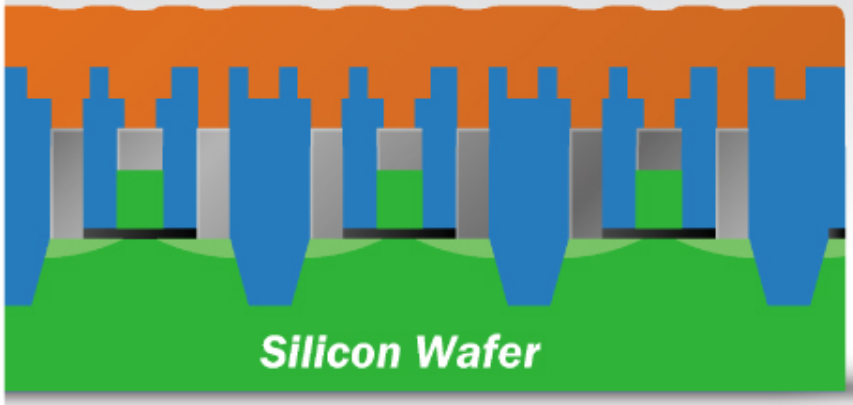

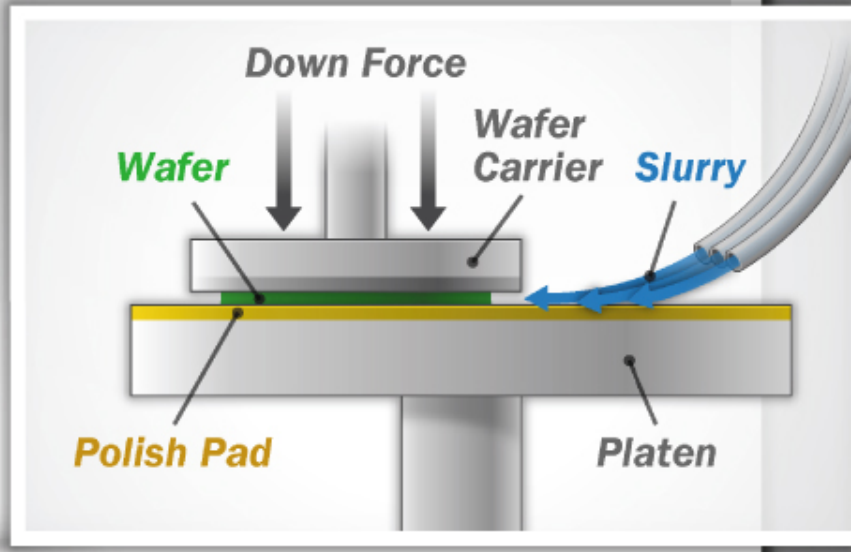

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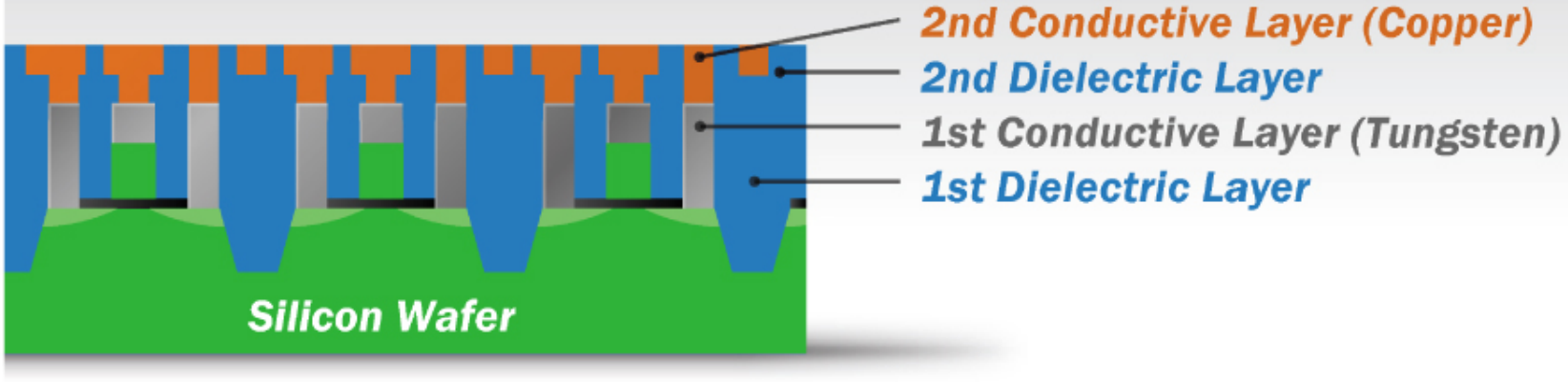

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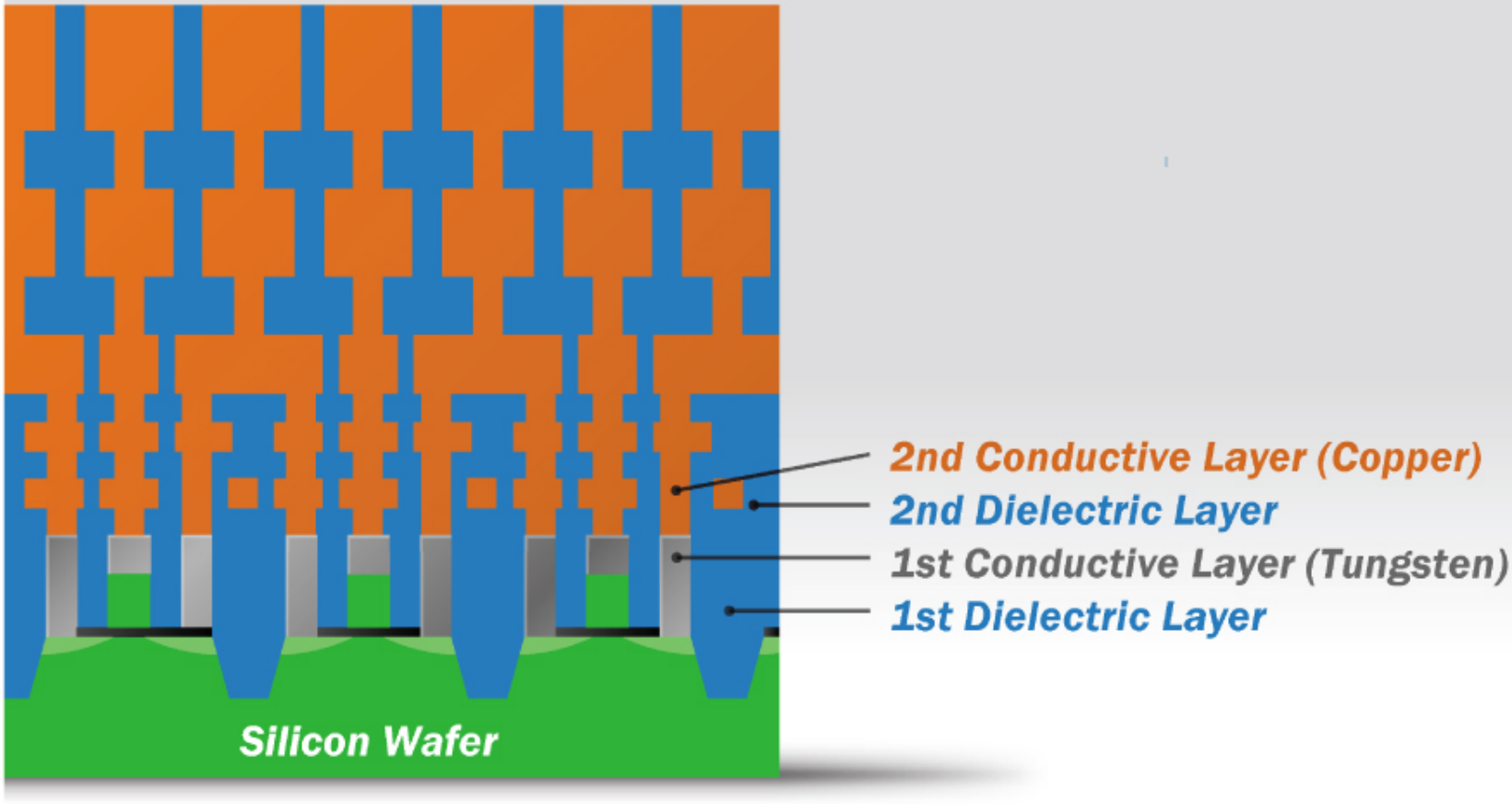
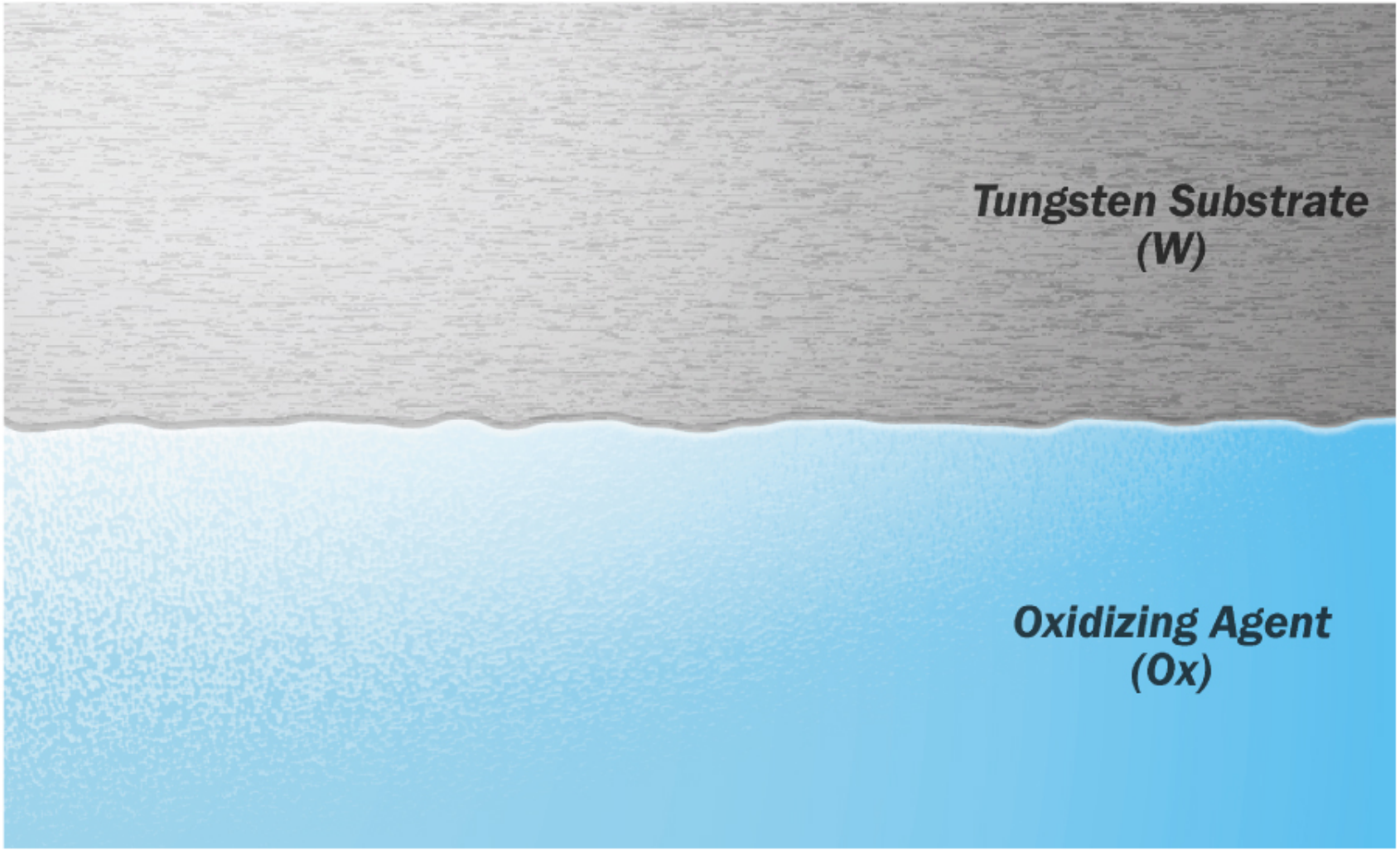


Oxidation of a Metal Surface

ELECTRONS ARE "SHUFFLED"

Oxidation of a Metal Surface — Electrons Are "Shuffled"



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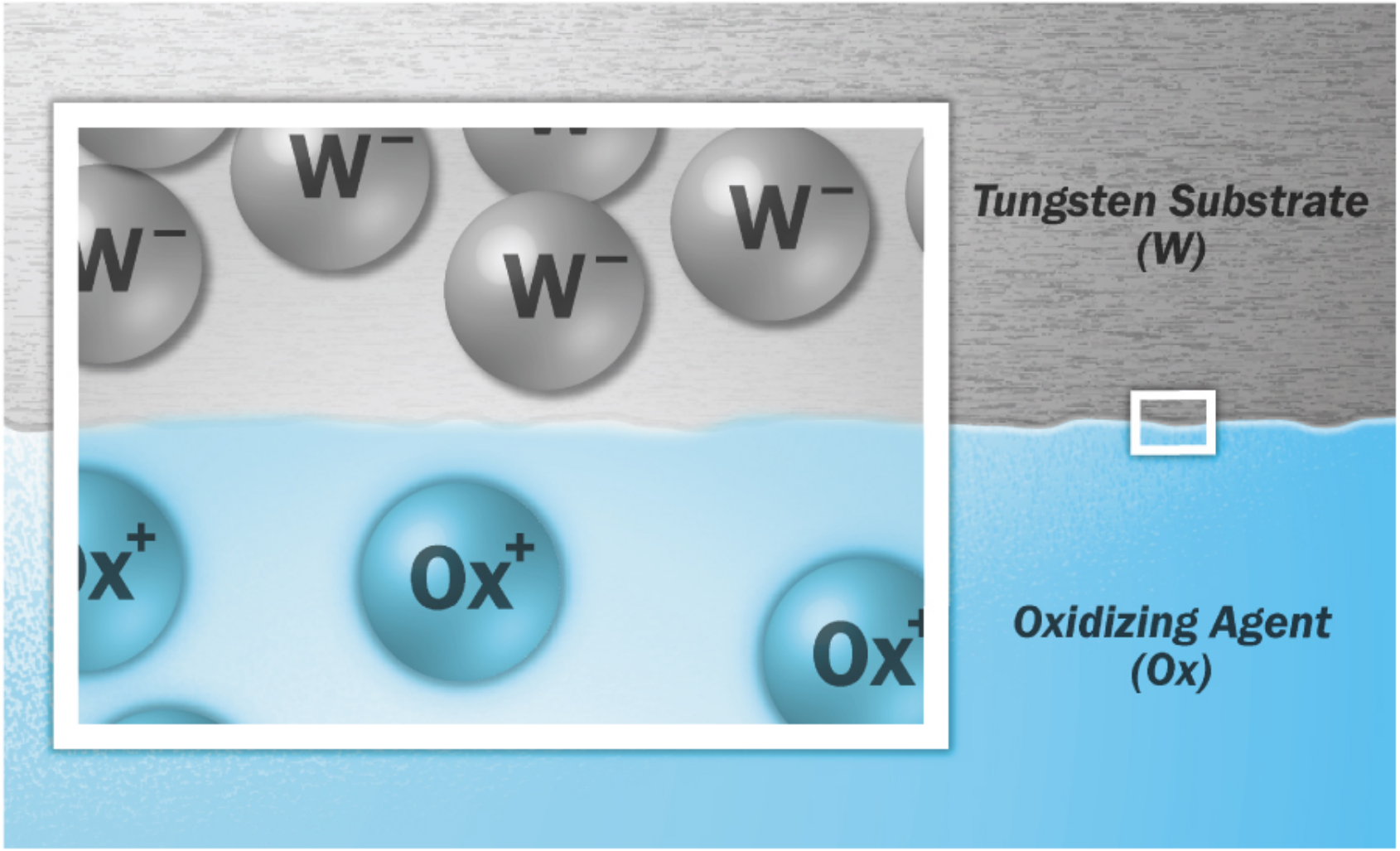

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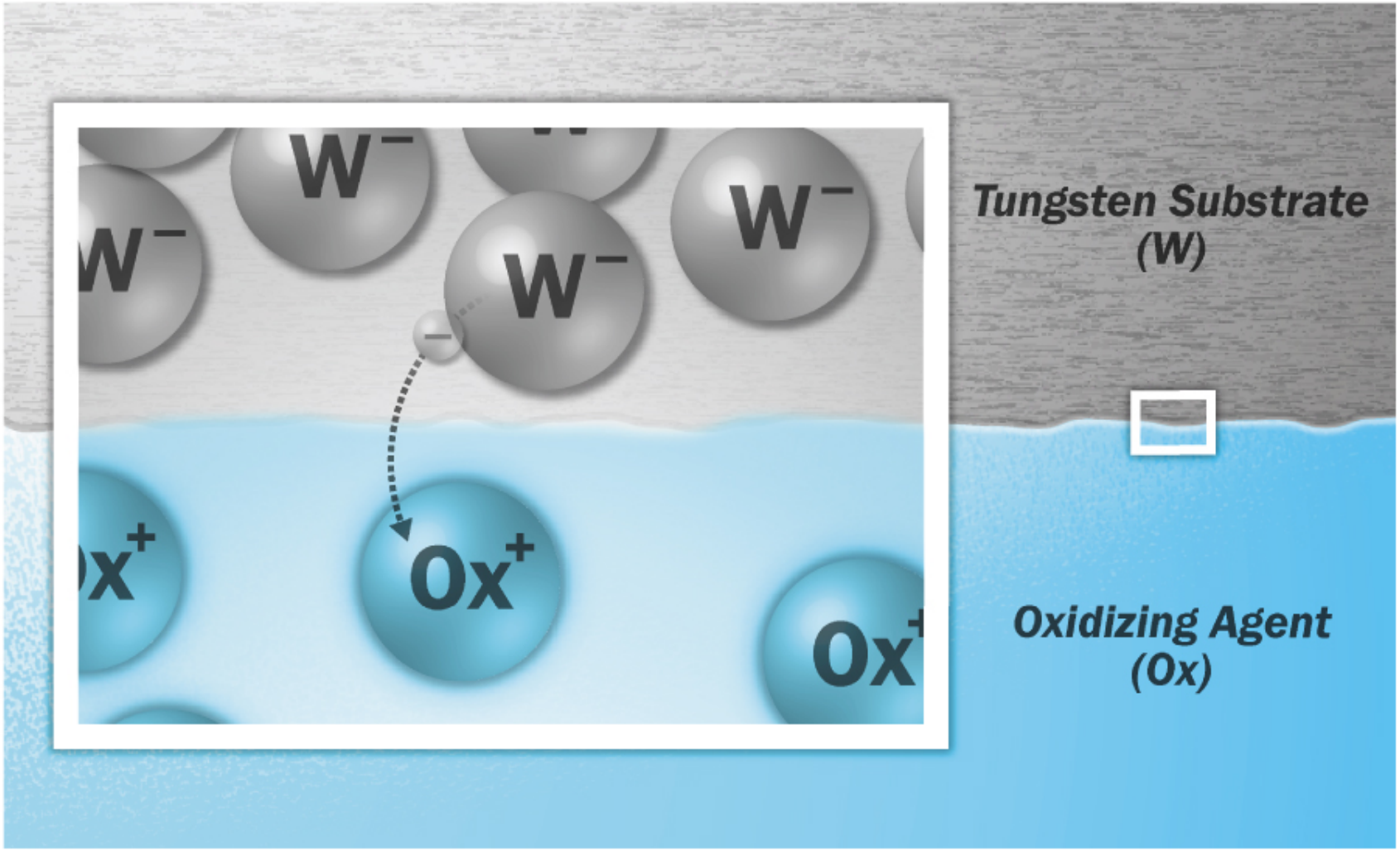

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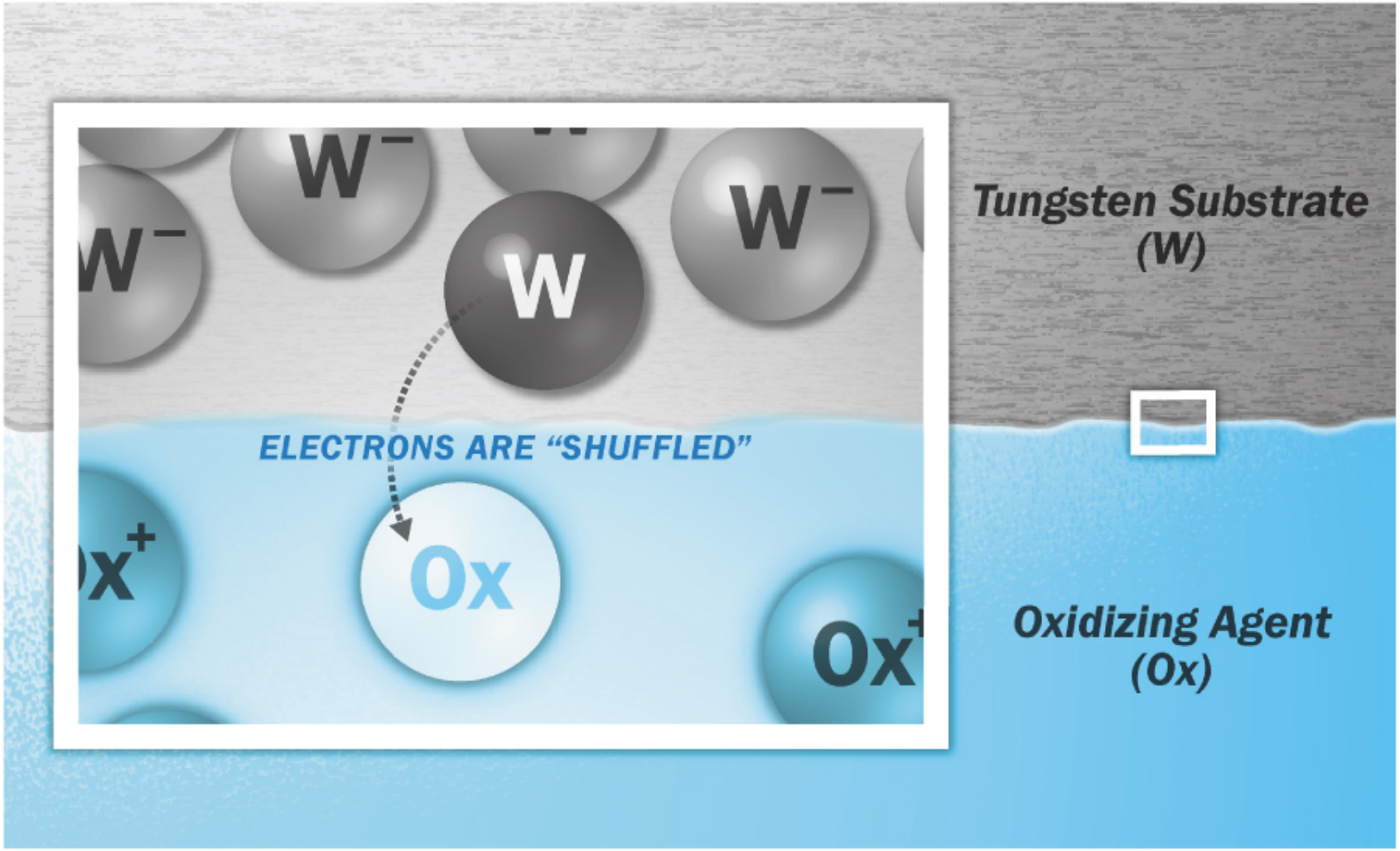

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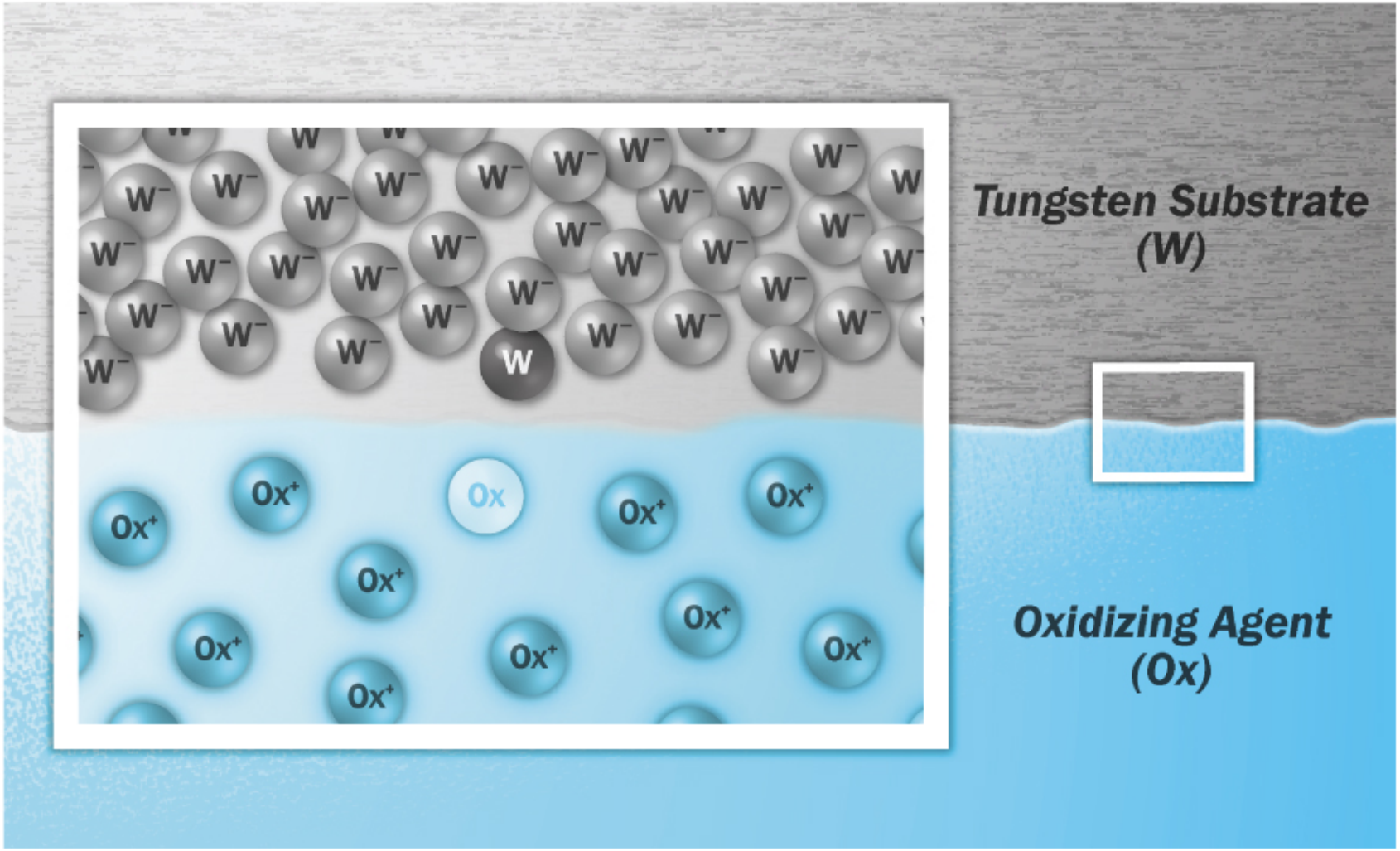

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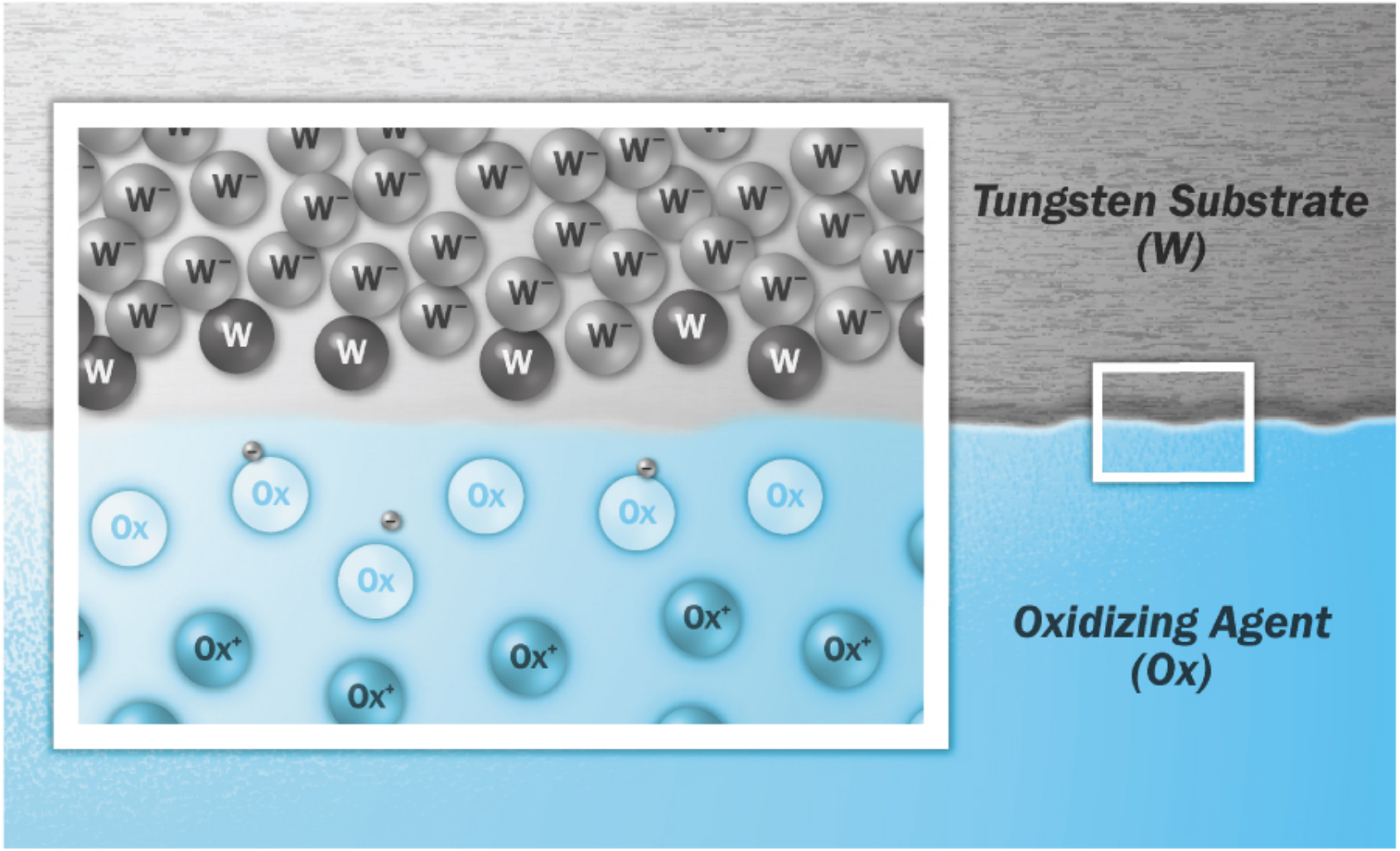

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