

Semiconductor Technology from A to Z

Fundamentals

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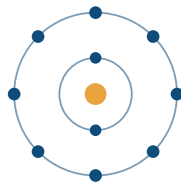
Noble gases

Noble Gases and the Electron Octet

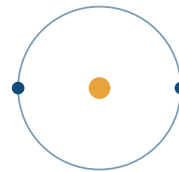
Noble gases are the elements in the eighth main group of the periodic table: helium, neon, argon, krypton, xenon, radon (from top to bottom).

What makes these elements special is that they have eight electrons in their outermost shell. This electron octet represents an energetically very stable state that all elements strive to reach. The chapter on [bonds](#) explains how elements reach a full outer shell of eight electrons. Because of the stable noble gas configuration, these elements undergo almost no reactions (a few xenon-fluorine compounds, among others, do exist).

Noble gases



Neon: 8 valence electrons
on the second shell



Helium: 2 valence electrons
on the first shell

The neon atom has 10 electrons: two in the first shell and eight valence electrons in the second, outermost shell. Exception: the helium atom, which has only one shell, already reaches the noble gas state with two electrons (electron duet).

As inert gases [Lat. inert: idle, sluggish], nitrogen (e.g. as a purge gas in furnace processes) and argon (e.g. in sputtering processes), among others, are used in semiconductor manufacturing.