Visualizing parts per trillion

The hunt for semiconductor process gas impurities

The continual shrinking of semiconductor transistors – needed for everything from cell phones to planes – is allowing phenomenal amounts of processing power in nanoscale packages. But the tiny scale of measurements involved in semiconductors and their manufacture can be mind-boggling. Let's take a look!

The size of semiconductors

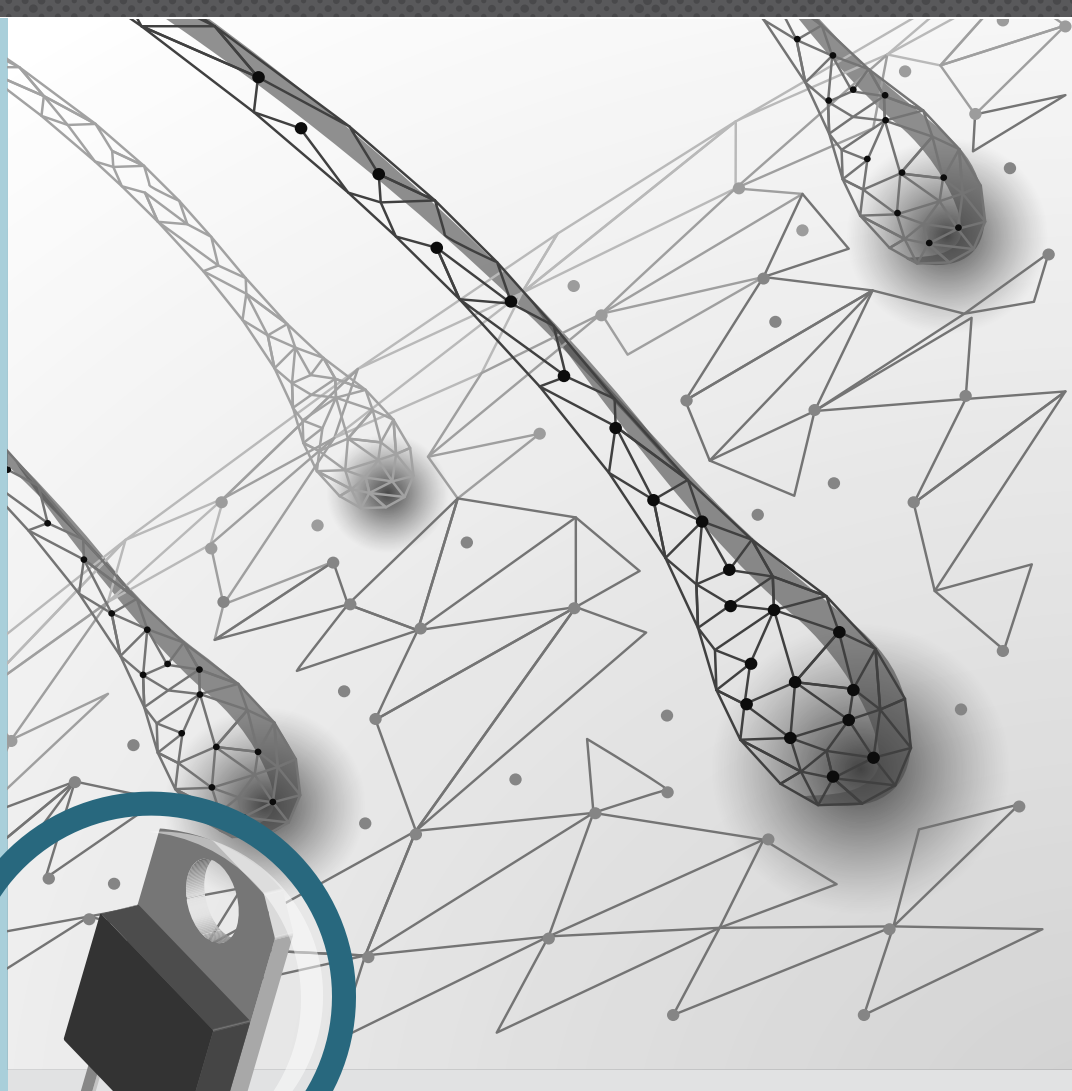
Semiconductor chips are tiny, even a single speck of dust can block the signal path entirely and render them completely useless.

The width of...

one human hair
= 80,000 nm

a speck of dust
= 10,000 nm

a semiconductor chip
= 10 nm



That means you could fit **8,000** chips across the diameter of a hair!

Gas impurities: the scale of the problem

Cocktails of helium, nitrogen, argon, and hydrogen used in the production of semiconductors must contain no more than 100 parts per trillion per impurity. Let's imagine that!

1 part per trillion =

- traveling 6 inches on a journey to the sun
- 1 second in 32,000 years
- 8 people out of the entire population on Earth
- 4 postage stamps in an area the size of the USA
- 1 flea on 360 million elephants

Chasing the parts per trillion

Detecting such miniscule levels of contamination requires state-of-the art monitoring technologies. Atmospheric pressure ionization mass spectrometry (API-MS) has analytical sensitivity capable of detecting contaminants in the 10-50 parts per trillion range, and in less than five seconds! **Click here to learn more about API-MS in the semiconductor industry.**

Imagine finding:

10 pieces of candy in 400 Olympic sized swimming pools

In the time it takes to say:

"Parts per trillion, parts per trillion, parts per trillion, parts per trillion, parts per trillion!"