INSTITUT FÜR SELTENE
ERDEN UND METALLE AG

ISE Specification 2026-0224-UCP

For semiconductors, ultra-high-purity metals and high-end copper Specifications based on GD/MS full analyses.

The selected elements are determined by their physical, electrical and process-related risks and are therefore considered impurities. Elements: **Li, Be, Cd, Ti, V, Co, Mo, Pt, Au, Bi**

Reason and classification:

Mobile ions (electrically highly critical) Li, Be (partially), Cd

Why critical?

- Can move in an electric field (ion migration)
- Cause drift in oxide layers (e.g. SiO_2)
- Can cause gate instabilities
- Problematic in CMOS structures

Li and Na in particular are considered extremely critical in semiconductor manufacturing.

Transition metals with deep-level effects Ti, V, Co, Mo

These elements:

- create deep energy levels in silicon
- act as recombination centres
- degrade minority carrier lifetime
- strongly influence semiconductor properties

Co and Mo are also relevant due to:

- diffusion in Cu structures
- use in barrier layers
- possible contamination in thin-film processes

Precious metals (very low tolerances) Pt, Au

Why are they problematic?

- Extremely low solubility in many metals
- Can occur unintentionally as foreign phases

Influence:

- Electrical conductivity
- Contact resistances
- Diffusion behaviour

Gold is particularly critical because it:

- Can be very mobile in copper
- Influences grain boundary diffusion

Corrosion and structure-critical elements Bi

Bismuth can:

- Cause embrittlement
- Influence grain boundaries
- Cause undesirable structural changes in copper
- Therefore often strictly limited in high-purity copper.

Summary

This group of elements is often specified together because it:

- Can interfere with semiconductor processes
- Influences electrical properties
- Causes diffusion
- Promotes recombination
- Or degrades material structure

It is therefore typical for:

- Semiconductor grade materials
- Ultra-high-purity metals
- GD-MS-based full analyses
- High-end copper powder specifications