Sulfuration is a phenomenon that the inner electrodes (Ag/Pd-type material) of chip resistors react with sulfur gas which creates silver sulfide. As sulfuration proceeds, the conduction of the inner electrode will be lost and the chip resistor gets disconnected.

**Sulfuration Phenomenon of Standard Chip Resistors**

\[
2\text{Ag} + \text{S}^{2-} \rightarrow \text{Ag}_2\text{S} + 2\text{e}^-
\]

Needle crystal of \( \text{Ag}_2\text{S} \)

Needle crystals appeared outside of chip resistor

![Diagram of chip resistor components and sulfuration process](image)

### Examples of Critical Environment

- Oil or grease for machine tools and gears sometimes includes sulfur substances
- Oil with high amount of impurities and exhaust gas after combusting the oil contains sulfur gas
- Rubber products or areas near rubber manufacturing plants
- Where fossil fuels are handled or used
- In case a PCB is molded by rubber sealing which includes sulfur
- In case components which generate sulfur are mounted in the surrounding (e.g. molded coatings which includes sulfur)
- Areas where volcanic gases are emitted
- Areas of biological gas cracking plants
- Near waste dumps / waste disposal sites

For more information, please contact:
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KOA’s special anti-sulfuration resistors are intended to be used under harsh environment with a high level of sulfur contamination. A high reliable material with extremely high sulfuration-proof characteristics is used in the inner top electrodes. Thanks to technical know-how of sulfuration-proof material, KOA has been able to achieve an extremely high level of sulfuration-proof performance.

**KOA’s Anti-Sulfur Resistors Line-up**

Resistors use anti-sulfur material for inner top electrodes

- **General purpose**
  - RK73B-RT
  - RK73H-RT
  - RK73Z-RT (Jumper)

- **High precision**
  - RK73G-RT

- **Anti-surge**
  - SG73-RT
  - SG73S/P-RT (High precision)

- **High power (wide terminal)**
  - WK73-RT

- **High voltage**
  - HV73-RT

- **Network arrays**
  - CN-RT
  - CN-KRT
  - *added CN1J4K-RT

The low ohm resistor series **WK73S** in the resistance range below 1 ohm will be added soon to KOA’s anti-sulfuration product portfolio.

If it’s intended to use products under harsh environment (under high density of sulphur), KOA recommends using the “Anti-Sulfuration Flat Chip Resistors” as a perfect measure.

**Product Features**
- Excellent anti-sulfuration characteristic due to using high-sulfuration-proof inner top electrode material
- Available for several standard product series (like RK73, SG73, CN)
- Intended for use under harsh environment

**Application Examples**
- Industrial control systems
- Automotive
- Electric instrumentation
- Power meter / conditioner
- Solar / wind inverter circuits
- Avionics

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