



Zinc Oxide (ZnO) is an inorganic compound commonly used in various applications, including cosmetics, pharmaceuticals, and industrial products. In the cosmetics industry, it is widely used as a physical sunscreen agent due to its ability to block a broad spectrum of ultraviolet (UV) radiation.

Chemical Properties of Zinc Oxide:

- 1. Chemical Structure:**
 - **Chemical Formula:** ZnO
 - **Molecular Weight:** 81.38 g/mol
 - **Structure:** Zinc oxide consists of one zinc atom (Zn) bonded to one oxygen atom (O). It typically forms a hexagonal crystal structure, which contributes to its stability and effectiveness.
- 2. Physical Properties:**
 - **Appearance:** Zinc oxide is a white, odorless, and powdery substance.
 - **Solubility:** Insoluble in water, but soluble in acids and alkaline solutions.
 - **Melting Point:** Approximately 1,975°C.
 - **Boiling Point:** Sublimes at about 1,800°C.
- 3. UV Absorption and Reflection:**

- **Broad-Spectrum UV Protection:** Zinc oxide is highly effective at blocking both UV-A (320-400 nm) and UV-B (280-320 nm) radiation. It works by reflecting and scattering UV rays, providing physical protection against sunburn and skin damage.
 - **Opacity and Whiteness:** Due to its high refractive index, zinc oxide provides excellent coverage and contributes to the whiteness and opacity of sunscreens and other products.
4. **Photostability:**
- Zinc oxide is highly photostable, meaning it does not degrade when exposed to sunlight. This ensures long-lasting protection in sunscreen formulations.
 - In nanoparticle form, there are concerns about potential photocatalytic activity, which could lead to the formation of reactive oxygen species (ROS). To mitigate this, zinc oxide nanoparticles are often coated with inert materials such as silica or alumina.