**Introduction to Inorganic Chemistry**

Inorganic chemistry is the study of the synthesis, reactions, structures and properties of compounds of the elements. Inorganic chemistry encompasses the compounds - both molecular and extended solids - of everything else in the periodic table, and overlaps with organic chemistry in the area of organometallic chemistry, in which metals are bonded to carbon-containing ligands and molecules. Inorganic chemistry is fundamental to many practical technologies including catalysis and materials (structural, electronic, magnetic etc.), energy conversion and storage, and electronics. Inorganic compounds are also found in biological systems where they are essential to life processes.

**Inorganic chemistry** deals with [synthesis](https://en.wikipedia.org/wiki/Chemical_synthesis) and behavior of [inorganic](https://en.wikipedia.org/wiki/Inorganic_compound) and [organometallic](https://en.wikipedia.org/wiki/Organometallic_chemistry) compounds. This field covers [chemical compounds](https://en.wikipedia.org/wiki/Chemical_compound) that are not carbon-based, which are the subjects of [organic chemistry](https://en.wikipedia.org/wiki/Organic_chemistry). The distinction between the two disciplines is far from absolute, as there is much overlap in the subdiscipline of [organometallic chemistry](https://en.wikipedia.org/wiki/Organometallic_chemistry). It has applications in every aspect of the chemical industry, including [catalysis](https://en.wikipedia.org/wiki/Catalysis), [materials science](https://en.wikipedia.org/wiki/Materials_science), [pigments](https://en.wikipedia.org/wiki/Pigment), [surfactants](https://en.wikipedia.org/wiki/Surfactant), [coatings](https://en.wikipedia.org/wiki/Coating), [medications](https://en.wikipedia.org/wiki/Pharmaceutical_drug), [fuels](https://en.wikipedia.org/wiki/Fuel), and [agriculture](https://en.wikipedia.org/wiki/Agriculture).[[1]](https://en.wikipedia.org/wiki/Inorganic_chemistry#cite_note-1)

### **ACS Division of Inorganic Chemistry**

## **What Is Inorganic Chemistry? ACS**

Inorganic chemistry is concerned with the properties and behavior of inorganic compounds, which include metals, minerals, and organometallic compounds. While [organic chemistry](https://www.acs.org/content/acs/en/careers/college-to-career/areas-of-chemistry/organic-chemistry.html) is defined as the study of carbon-containing compounds and inorganic chemistry is the study of the remaining subset of compounds other than organic compounds, there is overlap between the two fields (such as organometallic compounds, which usually contain a metal or metalloid bonded directly to carbon).

## **Where Is Inorganic Chemistry Used?**

Inorganic compounds are used as catalysts, pigments, coatings, surfactants, medicines, fuels, and more. They often have high melting points and specific high or low electrical conductivity properties, which make them useful for specific purposes. For example:

* **Ammonia** is a nitrogen source in fertilizer, and it is one of the major inorganic chemicals used in the production of nylons, fibers, plastics, polyurethanes (used in tough chemical-resistant coatings, adhesives, and foams), hydrazine (used in jet and rocket fuels), and explosives.
* **Chlorine** is used in the manufacture of polyvinyl chloride (used for pipes, clothing, furniture etc.), agrochemicals (e.g., fertilizer, insecticide, or soil treatment), and pharmaceuticals, as well as chemicals for water treatment and sterilization.
* **Titanium dioxide** is the naturally occurring oxide of titanium, which is used as a white powder pigment in paints, coatings, plastics, paper, inks, fibers, food, and cosmetics. Titanium dioxide also has good ultraviolet light resistance properties, and there is a growing demand for its use in photocatalysts.

Inorganic chemistry is a highly practical science—traditionally, a nation’s economy was evaluated by their production of sulfuric acid because it is one of the more important elements used as an industrial raw material.

**Work Settings**

Inorganic chemists are employed in fields ranging from mining to microchips. Their work is based on understanding the behavior and the analogues for inorganic elements and how these materials can be modified, separated, and used. It includes developing methods to recover metals from waste streams; employment as analytical chemists specializing in the analysis of mined ores; and performing research on the use of inorganic chemicals for treating soil.

Many inorganic chemists work in industry, but they also work in academic institutions and in government labs. Inorganic chemists who work in government say their time is increasingly spent writing grant proposals and competing for research money.

Inorganic chemists compare their jobs to those of materials scientists and physicists. The common focus is on the exploration of the relationship between physical properties and functions, but an inorganic chemist is more concerned with these properties at the molecular level.

**Industries that Hire Inorganic Chemists**

### **Environmental Science**

Environmental chemistry uses inorganic chemistry to understand how the uncontaminated environment works, which chemicals in what concentrations are present naturally, and with what effects. They also identify the effects of additives, such as fertilizers, on natural processes. The [U.S. Environmental Protection Agency](http://www.epa.gov/) and other agencies detect and identify the nature and source of pollutants.

Companies that focus in environmental science include [CH2M Hill](http://www.ch2m.com/corporate/), [Bechtel](http://www.bechtel.com/), [Veolia](http://www.veolia.com/en), [URS Corporation](http://www.urs.com/), [Black & Veatch](http://bv.com/), [Tetra Tech](http://www.tetratech.com/), [Energy Solutions](http://www.energysolutions.com/), and government agencies as the [U.S. Environmental Protection Agency](http://www.epa.gov/) (EPA). These companies study the chemical and biochemical phenomena that occur in natural places. They use atmospheric, aquatic, and soil chemistry, as well as analytical chemistry. Others includes: -

### Fibers and Plastics

### Microchip

### Mining, Ore, and Metals

### Paint, Pigment, and Coatings

**Topics in inorganic chemistry**

* Industrial inorganic chemistry
* [Descriptive inorganic chemistry](https://en.wikipedia.org/wiki/Inorganic_chemistry#Descriptive_inorganic_chemistry)
* Coordination compounds
* Main group compounds
* Transition metal compounds
* Organometallic compounds
* Cluster compounds
* Bioinorganic compounds
* Solid state compounds
* Theoretical inorganic chemistry
* Qualitative theories
* Molecular symmetry group theory
* [Thermodynamics and inorganic chemistry](https://en.wikipedia.org/wiki/Inorganic_chemistry#Thermodynamics_and_inorganic_chemistry)
* [Mechanistic inorganic chemistry](https://en.wikipedia.org/wiki/Inorganic_chemistry#Mechanistic_inorganic_chemistry)
  + [Main group elements and lanthanides](https://en.wikipedia.org/wiki/Inorganic_chemistry#Main_group_elements_and_lanthanides)
  + [Transition metal complexes](https://en.wikipedia.org/wiki/Inorganic_chemistry#Transition_metal_complexes)
* Redox reactions
* Reactions at ligands
* Characterization of inorganic compounds
* Synthetic inorganic chemistry

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