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Platinum

78

Pt

195.078(2)



background

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platinum compounds

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nuclear properties

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- ▶ Electron binding energies
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physical properties

The essentials

- Name: platinum
- Symbol: Pt
- Atomic number: 78
- Atomic weight: 195.078 (2)
- CAS Registry ID: 7440-06-4
- Group number: 10
- Group name: Precious metal or platinum group metal
- Period number: 6
- Block: d-block

Description

Here is a brief [description](#) of platinum.

- **Standard state:** solid at 298 K
- **Colour:** greyish white
- **Classification:** Metallic
- **Availability:** platinum is available in many forms including foil, sheet, wire, insulated wire, "evaporation slugs", gauze, powder, sponge, and mesh. Small and large samples of platinum foil, sheet, wire, insulated wire and mesh (and platinum alloys in wire and insulated wire form) can be purchased from [Advent](#)



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compounds

Select formula from below:

Fluorides

- ▶ PtF₄
- ▶ PtF₆
- ▶ [PtF₅]₄

Chlorides

- ▶ PtCl₃
- ▶ PtCl₄
- ▶ Pt₆Cl₁₂

Bromides

- ▶ PtBr₂
- ▶ PtBr₃
- ▶ PtBr₄

Iodides

- ▶ PtI₂
- ▶ PtI₃
- ▶ PtI₄

Hydrides

- ▶ none listed

Oxides

- ▶ PtO₂·H₂O
- ▶ PtO
- ▶ PtO₂
- ▶ PtO₃

- ▶ Bulk properties (density, resistivity, etc.)
- ▶ Thermal properties (melting point, etc.)
- ▶ Thermodynamic properties

crystallography

- ▶ Crystal structure
- ▶ [view VR world]
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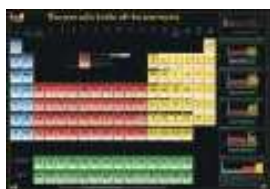
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Ruthenium, rhodium, palladium, osmium, iridium, and platinum together make up a group of elements referred to as the platinum group metals (PGM).



The above shows a platinum crucible.

Platinum is a beautiful silvery-white metal, when pure, and is malleable and ductile. It has a coefficient of expansion almost equal to that of soda-lime-silica glass, and is therefore used to make sealed electrodes in glass systems.

The metal does not oxidise in air. It is insoluble in hydrochloric and nitric acid, but dissolves when they are mixed as aqua regia, forming chloroplatinic acid (H_2PtCl_6), an important compound. It is corroded by halogens, cyanides, sulphur and alkalis. Hydrogen and oxygen gas mixtures explode in the presence of platinum wire.

Isolation

Here is a brief summary of the **isolation** of platinum.

It would not normally be necessary to make a sample of platinum in the laboratory as the metal is available commercially. The industrial extraction of platinum is complex as the metal occurs in ores mixed with other metals such as palladium and gold. Sometimes extraction of the precious metals such as platinum and palladium is the main focus of a particular industrial operation while in other cases it is a byproduct. The extraction is complex and only worthwhile since platinum is the basis of important catalysts in industry.

Preliminary treatment of the ore or base metal byproduct

Sulfides

- ▶ PtS
- ▶ PtS₂

Selenides

- ▶ PtSe₂

Tellurides

- ▶ PtTe
- ▶ PtTe₂

Nitrides

- ▶ none listed

Carbonyls

- ▶ Pt(CO)₄

Complexes

- ▶ $\text{K}[\text{PtCl}_3(\text{C}_2\text{H}_4)] \cdot \text{H}_2\text{O}$
- ▶ Pt(CN)₂
- ▶ $\text{Ba}[\text{Pt}(\text{CN})_4] \cdot 4\text{H}_2\text{O}$
- ▶ $\text{K}_2[\text{Pt}(\text{CN})_4]$
- ▶ $\text{K}_2[\text{Pt}(\text{CN})_6]$
- ▶ $(\text{NH}_4)_2[\text{PtBr}_6]$
- ▶ $\text{Na}_2[\text{PtBr}_6] \cdot 6\text{H}_2\text{O}$
- ▶ $[\text{PtCl}_2(\text{NH}_3)_2]$
- ▶ $[\text{PtCl}_2(\text{NH}_3)_2]$
- ▶ $\text{K}[\text{PtCl}_3(\text{NH}_3)]$
- ▶ $(\text{NH}_4)_2[\text{PtCl}_4]$
- ▶ $\text{PtCl}_4 \cdot 5\text{H}_2\text{O}$
- ▶ $\text{K}_2[\text{PtCl}_4]$
- ▶ $(\text{NH}_4)_2[\text{PtCl}_6]$
- ▶ $\text{Na}_2[\text{PtCl}_6] \cdot 6\text{H}_2\text{O}$
- ▶ $\text{K}_2[\text{PtCl}_6]$
- ▶ $\text{K}_2[\text{PtI}_6]$
- ▶ $\text{K}_2[\text{Pt}(\text{NO}_2)_4]$



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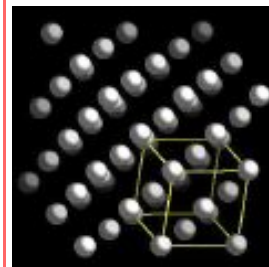
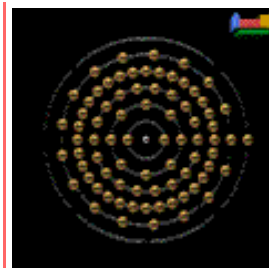
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with aqua regia (a mixture of hydrochloric acid, HCl, and nitric acid, HNO₃) gives a solution containing complexes of gold and palladium as well as H₂PtCl₆. The gold is removed from this solution as a precipitate by treatment with iron chloride (FeCl₂). The platinum is precipitated out as impure (NH₄)₂PtCl₆ on treatment with NH₄Cl, leaving H₂PdCl₄ in solution. The (NH₄)₂PtCl₆ is burned to leave an impure platinum sponge. This can be purified by redissolving in aqua regia, removal of rhodium and iridium impurities by treatment of the solution with sodium bromate, and precipitation of pure (NH₄)₂PtCl₆ by treatment with ammonium hydroxide, NH₄OH. This yields platinum metal by burning.



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