

Radium

Ra

General Information

Discovery

Radium was discovered by Pierre and Marie Curie in 1898 in Paris, France, from pitchblende. There is about 1 gram of radium in 7 tonnes of pitchblende.

It was isolated in 1911 by Marie Curie and Debierne, by the electrolysis of a solution of pure radium chloride.

Appearance

Pure radium is brilliant white when freshly prepared, but blackens on exposure to the air. The metal and its salts luminesce.

Source

Radium is present in all uranium ores, and could be extracted as a by-product of uranium refining. The usual source of pitchblende comes from Bohemia, but some radium-containing ores are found in Canada and the USA. Annual production of this element is less than 100 grams.

Uses

Radium was formerly used in the production of luminous paints, but this is now considered too hazardous. The element gives off small amounts of radon gas which has been used to treat cancer, but this use is now also considered too toxic - other radioactive sources are more powerful and safer to use.

Biological Role

Radium has no known biological role. It is toxic due to its radioactivity.

General Information

Radium reacts with both oxygen and water, and is rather more volatile than barium. Its compounds give a carmine red colour to a suitable flame.

Radium emits alpha, beta and gamma rays. The final product of its disintegration is lead.

Physical Information

Atomic Number	88
Relative Atomic Mass ($^{12}\text{C}=12.000$)	226.02
Melting Point/K	973
Boiling Point/K	1413
Density/kg m ⁻³	5000 (293K)
Ground State Electron Configuration	[Rn]7s ²

Key Isotopes

Nuclide	²²³ Ra	²²⁴ Ra	²²⁶ Ra	²²⁸ Ra
Atomic mass	223.02	224.02	226.03	228.03
Natural abundance	some	some	some	some
Half-life	11.43 days	3.64 days	1602 yrs	5.77 yrs

Ionisation Energies/kJ mol⁻¹

M - M ⁺	509.3
M ⁺ - M ²⁺	979
M ²⁺ - M ³⁺	3300
M ³⁺ - M ⁴⁺	4400
M ⁴⁺ - M ⁵⁺	5700
M ⁵⁺ - M ⁶⁺	7300
M ⁶⁺ - M ⁷⁺	8600
M ⁷⁺ - M ⁸⁺	9900
M ⁸⁺ - M ⁹⁺	13500
M ⁹⁺ - M ¹⁰⁺	15100

Other Information

Enthalpy of Fusion/kJ mol ⁻¹	7.15
Enthalpy of Vaporisation/kJ mol ⁻¹	136.7

Oxidation State

Ra⁺²