



>>Entry Name: Iron

ENTRY UNDER REVIEW

Synonym(s): Ferrum (L.)

CAS Registry Number: 7439-89-6

Related CAS Registry Numbers(s): 12596-02-0 12596-03-1 12596-04-2 12663-83-1 12663-84-2 12663-85-3 12663-86-4 12663-87-5 14067-02-8 14067-08-4 14067-09-5 14067-10-8 14127-53-8 14127-54-9 14127-55-0 15438-31-0 16603-85-3 16904-22-6 16904-25-9 16941-36-9 16941-64-3 16941-65-4 20074-52-6 20074-52-6 37240-35-0 37366-92-0 99007-60-0

Fe

Molecular Formula: Fe

Molecular Weight: 55.847

Accurate Mass: 55.934939

Percentage Composition: Fe 100.00%

being ^{56}Fe (91.6%). 4th most abundant element in earth's crust (62,000 ppm) with traces in sea water. Most important of all metals. Four allotropic forms (α , β , γ , δ) with transition temps. 770°, 928°, 1530°. α -Form (bcc) is magnetic; β -form (also bcc) is not magnetic

Source/Synthesis: Rarely found native because of ease of oxidation. Main ores are haematite (Fe_2O_3), magnetite (Fe_3O_4), siderite (FeCO_3), pyrite (FeS_2), and various silicates.

Obt. from oxides heated in blast furnace with coke + limestone $\rightarrow$ pig iron (impure). Pure iron obt. by reducing oxides or $\text{Fe}(\text{OH})_3$ with H_2 and by electrolysis of FeCl_3

Use/Importance: Main use as various alloys e.g. with C, Si, V, Cr, Ni, in construction work (building frames, bridges, motor vehicles) and tools. Essential biological role in oxygen transport (haemoglobin)

Physical Description: Silvery white metal, rel. soft when pure. Traces of impurities have profound effect on physical props. (steels). Rapidly oxidised, esp. in damp air (rust).

Attacked by dil. acids ($\rightarrow \text{H}_2$). Passivated by HNO_3

Melting Point: Mp 1535°

Boiling Point: Bp 3000° (2750°)

Hazard & Toxicity: Potentially toxic in all forms and by all routes of exposure, e.g. arc welder's lung. Ultrafine powdered metal is pyrophoric

Aldrich: 33814-1

Fluka: 44902

Sigma: C3518

>>Variant: Iron 52

CAS Registry Number: 14093-04-0

Source/Synthesis: Prod. from Cr ($\alpha, 2n$), ^{55}Mn ($p, 4n$), or bombardment of Cr with ^3He . Commercial production route: ^{58}Ni ($p, 3p4n$) by proton bombardment of Ni foil

Use/Importance: Used in diagnostic nuclear medicine

Other Data: $I = +0$. Decays by $\beta^{(+)}$ emission, or orbital electron capture to ^{52}Mn

>>Variant: Iron 53

CAS Registry Number: 14390-97-7

Source/Synthesis: Prod. from Cr (α, n), Cr ($\alpha, 3n$), ^{54}Fe (d, t), ^{54}Fe ($n, 2n$), ^{54}Fe (p, pn), or ^{55}Mn ($p, 3n$)

Other Data: $I = -7/2$. Decays by orbital electron capture or $\beta^{(+)}$ emission to ^{53}Mn

>>Variant: Iron 53m

Source/Synthesis: Prod. from Mn ($p, 3n$), Fe (p, pn), ^{54}Fe (d, t), ^{54}Fe ($n, 2n$), or ^{52}Cr ($\alpha, 3n$)

Other Data: $I = -19/2$. Decays by isomeric transition to ^{53}Fe

>>Variant: Iron 54

CAS Registry Number: 13982-24-6

Other Data: $I = +0$

>>Variant: Iron 55

CAS Registry Number: 14681-59-5

Source/Synthesis: Prod. from Fe (n, γ) (commercial production route requiring irradiation for *ca.* 1 y)

Use/Importance: Used in diagnostic nuclear medicine

Other Data: $I = -3/2$. Decays by orbital electron capture to ^{55}Mn