

UNIT 4 • d- AND f-BLOCK ELEMENTS

Formation of Interstitial Compounds

How trapping small atoms (H, C, N) transforms the crystal lattices of transition metals.

The Language of the Lattice

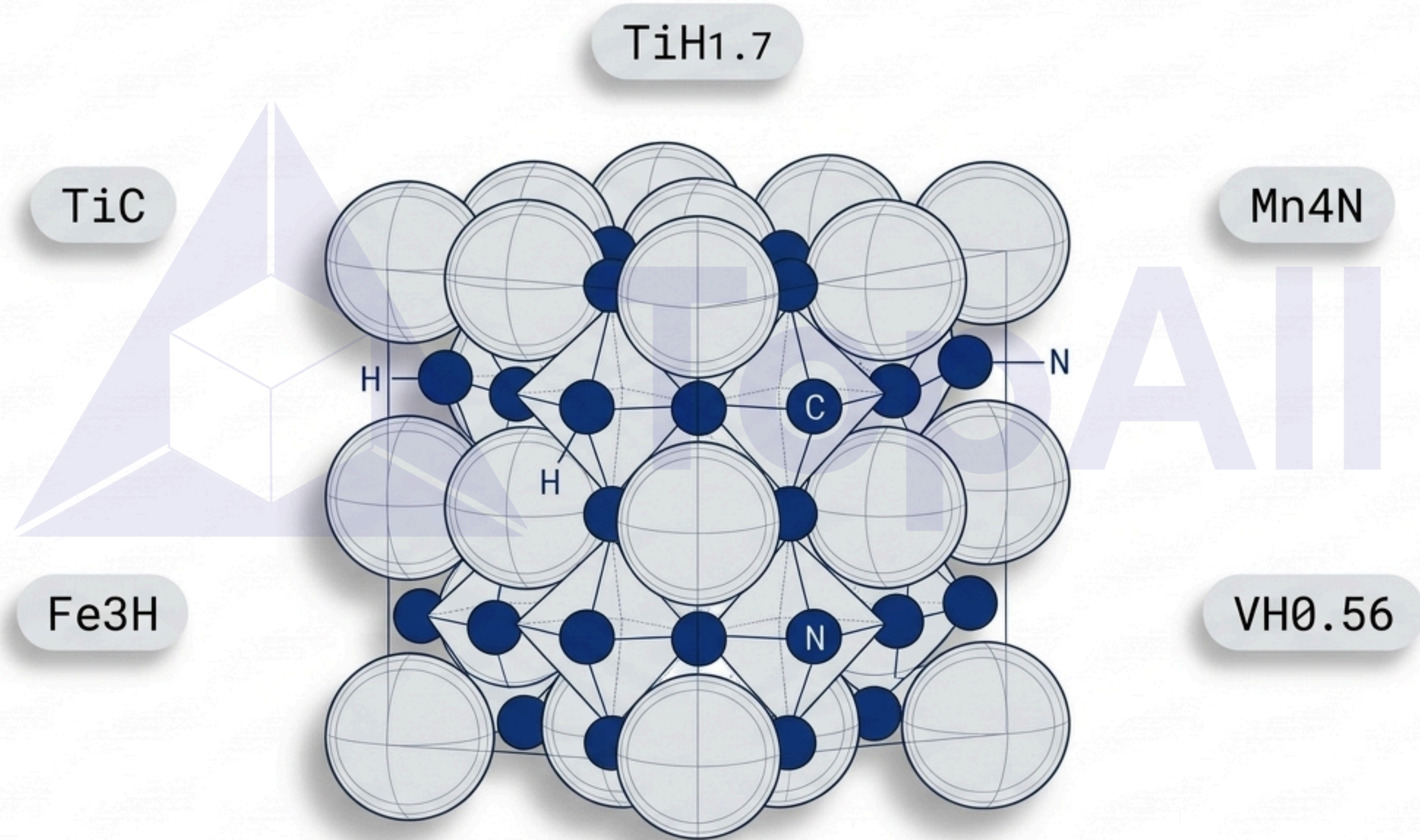
Interstitial Compound

A compound formed when small atoms are trapped inside the gaps (interstices) of a metal's crystal lattice.

Non-stoichiometric

A compound whose elemental composition cannot be represented by a ratio of well-defined natural numbers (neither typically ionic nor covalent).

Inside the Crystal Lattice





You've Learned the Theory. Let's Test Them Now.

$$E=mc^2$$



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Physical & Chemical Consequences

High Melting Point

Higher than those of the pure parent metals.

Extreme Hardness

Some borides approach diamond in hardness.

Retains Conductivity

Maintains typical metallic electrical conductivity despite lattice disruption.

Chemically Inert

Becomes highly resistant to chemical attack.

The Oxidation State Illusion

⚠ WATCH FOR THIS

Formulas $\neq$ Oxidation States

In formulas like $\text{VH}_{0.56}$ or $\text{TiH}_{1.7}$, the decimal subscripts do not correspond to any normal oxidation state of the metal. They merely represent the ratio of trapped atoms in the physical lattice structure.

Test Your Understanding

Which of the following statements regarding interstitial compounds like TiC and $\text{VH}_{0.56}$ is correct?

- A. They exhibit lower melting points than their pure parent metals.
- B. Their fractional formulas represent rare, non-integer oxidation states.
- C. They are chemically inert while retaining metallic conductivity.
- D. They are typically classic ionic compounds formed by complete electron transfer.

4.3.13 Interstitial Compounds

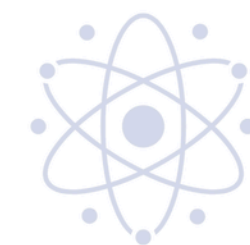
Structure: Formed when small atoms (H, C, N) are trapped in metal lattices. They are non-stoichiometric (e.g., $\text{TiH}_{1.7}$, Mn_4N) and do **not** represent standard oxidation states.

Properties: Despite the trapped atoms, they retain metallic conductivity but gain extreme hardness (some borides approach diamond), higher melting points, and chemical inertness.



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