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Inorganic Chemistry

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TOPIC:- Formation of Interstitial and Non-stoichiometric Compounds

Formation of Interstitial and Non-stoichiometric Compounds

Elements of the 3d-transition series are capable of forming interstitial compounds, e.g., Ti_2C, V_2C, ScN, TiN, Fe_4N etc. These compounds have the properties of alloys being hard and good conductors etc.

These elements also form non-stoichiometric compounds. For example, titanium forms TiO_x (x=0.65 - 1.25 and 1.998 - 2.000); vanadium forms VO_x (x= 0.79 - 1.29); manganese forms Mn_xO (x= 0.848 - 1.00); iron form Fe_xO (x = 0.833 - 0.957), etc. These compounds have variable composition and are formed due to the variability of oxidation states and solid defects. Sometimes the interstitial and non-stoichiometric compounds are the same.

Metallic Character and Alloy Formation

The metals of first transition series are hard, malleable and ductile. These exhibit face centered cubic (fcc), body centered cubic (bcc) or hexagonal close packed (hcp) type of lattice structures. These

metals are good conductors of heat and electricity. Copper and metals of the iron triad are softer than other metals.

The common alloys of these metals are as follows: brass (Cu-Zn), nichrome (Ni-Cr), monel metal (Cu-Ni), german silver (Cu-Ni-Zn), stainless steel (Fe-Cr-Ni-Mn), alnico steel (Fe-Ni-Co-Al), etc. These alloys are harder and have higher melting points than the parent metals. They are also more resistant to corrosion than their constituents.