

AMR-07 PHASE EQUILIBRIA IN MATERIALS

1. Phase rule, Lever rule & free energy of phase mixtures, Binary isomorphous system equilibrium phase rule,
2. Lever rule & free solidification, non-equilibrium solidification, dendritic growth, coring, CuNi alloys & zone refining.
3. Binary eutectic & hypoeutectic systems - solidification of eutectic, hypoeutectic & hypereutectic alloys.
4. Solidification of peritectic, hypoperitectic & hyperperitectic alloys, Morphologies of eutectic systems Binary monotectic & syntectic systems,
5. Stability of regular solution & miscibility gap, intrinsic stability of solution & spinodal, Hume Rothery rules & intermediate phases, e.g., laves, sigma, electron compounds, binary eutectoid, peritectoid, metatectic & monotectic systems,
6. Iron carbon phase diagram & microstructures of plain carbon steel & cast iron, Non-equilibrium structures, Binary ceramic systems,
7. Ternary phase diagrams Gibbs triangle isothermal & vertical sections polythermal projections, two-phase equilibrium, concept of tie-lines, rules for construction of tie-lines, three-phase equilibrium,
8. Concept of tie-triangle four-phase equilibria multi-component alloy systems stainless steels, high speed steels,
9. Hadfield steels, super alloys, light metal alloys, refractor systems.

Reference books:

1. Physical Metallurgy, V. Raghvan (PHI)
2. Materials Science and Engineering, V. Raghvan
3. Phase Diagrams in Metallurgy, Frederic N. Rhines (Mc Graw Hill)
4. Introduction to Physical Metallurgy, Sidney H Avner (TMH)