

NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Metallurgy and Material Science - NOC:Diffusion in Multicomponent Solids

Subject Co-ordinator - Prof. Kaustubh Kulkarni

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction to the Course and Thermodynamics Refresher
- Lecture 2 - The Second law of Thermodynamics
- Lecture 3 - Application of Second law and Illustration of Intermixing as Irreversible Process
- Lecture 4 - Equilibrium, Stability and Phase Diagrams in Single Component Systems
- Lecture 5 - Third Law of Thermodynamics and Numerical Examples
- Lecture 6 - Thermodynamic Activity and Gibbs Free Energy of Mixing
- Lecture 7 - Entropy of mixing of Multicomponent Ideal Solution
- Lecture 8 - Regular Solution Model: Application to Ternary System
- Lecture 9 - Gibbs Free Energy-Composition Curves, Phase Diagrams and Gibbs Phase rule
- Lecture 10 - Exercise: Solution Thermodynamics
- Lecture 11 - Driving force for Diffusion, Chemical Potentials and Concentrations
- Lecture 12 - Diffusion flux and Frames of Reference
- Lecture 13 - Fick's Law
- Lecture 14 - Exercise: Deriving Sigma Cosine for any Cubic Lattice
- Lecture 15 - Fick's Law for Multicomponent Diffusion
- Lecture 16 - Diffusion Equation and Solution to Steady State Diffusion
- Lecture 17 - Conversion of Set of Interdiffusion Coefficients from One Dependent Compared to Another
- Lecture 18 - Refresher on Laplace Transform
- Lecture 19 - Error Function and Its Laplace transform
- Lecture 20 - Instantaneous Planar Source: Solution to Diffusion Equation and Its Applications
- Lecture 21 - Solution to Diffusion Equation for Semi-Infinite Slab and Its Application in Carburizing of Steel
- Lecture 22 - Solution to Diffusion Equation for Binary Diffusion Couple
- Lecture 23 - Solution to Diffusion Equation for Multicomponent Diffusion Couple
- Lecture 24 - Nature of Concentration Profiles in Binary and Multicomponent Diffusion Couples
- Lecture 25 - Numerical Problems
- Lecture 26 - Homogenization of Multicomponent alloys
- Lecture 27 - Solution to Diffusion Equation: Periodic Boundary Conditions
- Lecture 28 - Energetics of Vacancy Formation
- Lecture 29 - Experimental Determination of Enthalpy of Vacancy Formation

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- Lecture 30 - Mechanisms of Diffusion in Metals and Alloys
- Lecture 31 - Point Defects in Intermetallics and Ionic Compounds
- Lecture 32 - Diffusion Mechanisms in Intermetallics
- Lecture 33 - Theory of Random Walk: Mean Squared Displacement
- Lecture 34 - Physical Significance of Diffusivity: Einstein-Smoluchowski Equation
- Lecture 35 - Derivation of Correlation Factors in Cubic Crystals by Vacancy Mechanism
- Lecture 36 - Correlation Factors for Substitutional Diffusion by Vacancy Mechanism in FCC Crystal
- Lecture 37 - Correlation Effects in BCC and Diamond Cubic for Vacancy Mechanism
- Lecture 38 - Practice Problems
- Lecture 39 - Deriving Relation Between Diffusion Flux and Chemical Potential Gradients
- Lecture 40 - Atomic Mobility, Diffusivity and Diffusion Under External Driving Force
- Lecture 41 - Non-Ideality as Driving Force
- Lecture 42 - Theory of diffusion
- Lecture 43 - Experimental Determination of Interdiffusion Coefficients: Boltzmann Matano Analysis
- Lecture 44 - Analysis of Interdiffusion Fluxes in Multicomponent Diffusion Couples
- Lecture 45 - Various Techniques for Experimental Determination of Multicomponent Interdiffusion Coefficients
- Lecture 46 - Experimental Determination of Interdiffusion Coefficients: Examples from Literature
- Lecture 47 - Intrinsic Diffusion and Kirkendall Effect
- Lecture 48 - Experimental Determination of Intrinsic Diffusion Coefficients
- Lecture 49 - A Brief Introduction to Ternary Phase Diagram
- Lecture 50 - Multiphase Diffusion: Diffusion Paths and Diffusion Structures
- Lecture 51 - Interdiffusion Analysis of Multiphase Diffusion Couples