Introduction to Refractories course outline

Lecture 1

- Introduction to Refractories
- Thermal Properties
    - Volume Stability
        - Reversible Changes
        - Irreversible or Permanent Changes
    - Heat Capacity
    - Thermal Conductivity

Lecture 2

- Mechanical Properties
    - Elasticity
    - Brittle Fracture
    - Creep

Lecture 3

- Thermomechanical Properties
    - Thermal Stresses
    - Thermoelastic Theory
    - Thermal Shock Damage Resistance Theory
- Corrosion Properties
    - Fundamental Principles of Liquid-Solid Corrosion
    - Liquid Phase Formation
        - Wetting
        - Phase Equilibrium Diagrams

Lecture 4

- Silica Refractories
    - Raw Materials – Silica
    - Phase Relationships
    - Processing
    - Microstructure/Properties
- Alumino-Silicate Refractories
    - Raw Materials – Alumina-Silica
    - Phase Relationships
    - Processing
    - Microstructure/Properties

Lecture 5

- Basic Refractories
    - Raw Materials – Magnesite, Dolomite, Chrome-Magnesite, Forsterite, Spinel
    - Phase Relationships
    - Processing
    - Microstructure/Properties
- Insulating Refractories
    - Insulating Firebrick
        - Processing
        - Microstructure/Properties
    - Insulating Fibers
        - Processing
        - Microstructure/Properties

Lecture 6

- Monolithic Refractories
    - Raw Materials – Hydraulic Cement, No Cement, Chemical Binders
    - Phase Relationships
    - Processing
    - Microstructure/Properties
- Non-Oxide Refractories
    - Raw Materials – Carbon, Silicon Carbide, Silicon Nitride
    - Phase Relationships
    - Processing
    - Microstructure/Properties

Lecture 7

- Composite Refractories
    - Raw Materials – Magnesia-Carbon, Alumina-Silicon Carbide-Carbon, Alumina-Carbon
    - Processing
    - Microstructure/Properties
- Special Refractories
    - Raw Materials – Zirconia, Zircon, Fusion Cast – Alumina-Zirconia-Silica, Alumina, Alumina-Chrome, Magnesia-Chrome
    - Phase Relationships
    - Processing
    - Microstructure/Properties

Lecture 8

- Design of and with Refractories
    - Microstructural Design
    - Process Vessel Design
- Applications of Refractories
    - Iron and Steel
    - Non-Ferrous Metals
    - Ceramics
    - Glass
    - Minerals Processing
    - Chemicals