

ADVANCED THERMAL PROPERTIES OF REFRACTORIES

July 6, 8, 13, and 15, 2021

11:00 to 3:00 p.m. EDT (lunch break from 12:30-1:30)

COURSE OUTLINE

Advanced Thermal Properties of Refractories

July 6

- Thermal Stability
 - Definition
 - Thermodynamic Principles
 - Chemical Bonding
 - Application to Refractories
 - Melting Temperature vs. Free Energy of Formation Diagrams
- Heat Capacity
 - Definition
 - Dulong and Petit Model
 - Einstein Model
 - Debye Model
 - Electronic Contributions
 - Structural Aspects of Heat Capacity
 - Application to Refractories
 - Measurement Technique and Laboratory Demonstration
 - ASTM E1269 Heat Capacity by Differential Scanning Calorimetry

July 8

- Thermal Conductivity
 - Definition
 - Phonon Conductivity
 - Structural Aspects of Phonon Conductivity
 - Photon Conductivity
 - Structural Aspects of Photon Conductivity
 - Application to Refractories
 - Measurement Techniques and Laboratory Demonstrations
 - ASTM C201 Thermal Conductivity of Refractories by Water Calorimeter
 - ASTM C1113 Thermal Conductivity of Refractories by Hot Wire
 - ASTM E1461 Thermal Diffusivity and Conductivity by Laser Flash

July 13

- Thermal Expansion
 - Definition
 - Bonding and Potential Energy
 - Equation of State of Solids
 - Structural Aspects of Thermal Expansion
 - Application to Refractories
 - Reversible Changes
 - Irreversible or Permanent Changes
 - Thermal Conductivity-Thermal Expansion Relations
 - Measurement Technique and Laboratory Demonstration
 - E228 Thermal Linear Analysis

July 15

- Thermal Shock
 - Definition
 - Thermal Stresses
 - Thermal Expansion Mismatches
 - Temperature Gradients
 - Thermal Shock Theory
 - Thermoelastic Theory
 - Damage Resistance Theory
 - Application to Refractories
 - Measurement Technique and Laboratory Demonstration
 - ASTM C1171 Quantitatively Measuring the Effect of Thermal Cycling on Refractories