

**UNIVERSITY OF CALGARY
DEPARTMENT OF CHEMISTRY
COURSE OUTLINE
Winter 2020**

Course: CHEM 689.6, Selected Topics in Physical Chemistry - Winter 2020, Topic: Solid State Electrochemistry
Lecture 05: TR 12:30 - 13:45 in SA 243

Instructor	Email	Phone	Office	Hours	
Dr VenkataramanThangadurai	vthangad@ucalgary.ca	403 210-8649	ES 656E	By appointment	

Textbook: The course does not follow any specific book and required materials will be discussed in the class.

Topics to be covered

Solid State Defect Chemistry

- Lattice, Schottky, and Frenkel defects
- Kröger-Vink notations
- Thermodynamics of point defects
- Experimental investigations of lattice defects
- Equilibrium between A-site vacancies and B-site vacancies
- Equilibrium between electrons and holes
- Disorder equilibrium between solids and gas phases
- Examples of disorder in solids
- Defect equilibrium: Applications to ceramic proton conductors

Transport Properties

- Solid electrolytes and Mixed Conductors
- Transport Process of Charge Carriers in Solids
- Particle flux in the concentration gradient
- Particle flux in the electrical field
- Particle flux in both concentration gradient and electrical field
- Chemical Diffusion
- Determination of partial ionic and electronic conductivities
- Ion blocking and reversible electrodes
- Electron blocking reversible electrodes
- Experimental methods to determine the transference number
- Transference measurements
- EMF measurements using galvanic cells
- AC impedance and DC polarization measurements

Applications of Solid Electrolytes and Mixed Conductors

- Determination of Gibbs free energy of formation of inorganic compounds
- Determination of silver activities in solid state materials
- Determination of oxygen partial pressures in metal and metal oxide mixtures
- Energy conversion and storage devices

Department Approval _____ Electronically Approved _____ Date _____ January 6, 2020 _____