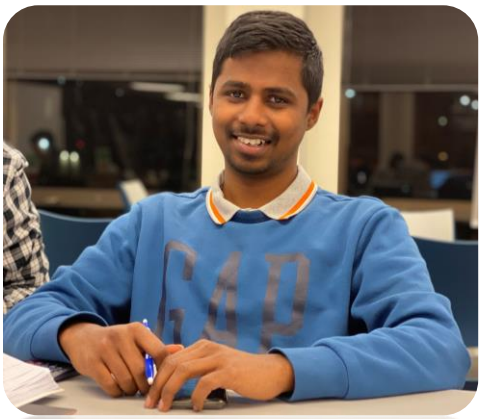
MISSOURI S&T Chemistry Seminar

Santhoshkumar Sundaramoorthy,
PhD Candidate,
Department of Chemistry, Missouri S&T



Monday, 24 April 2023

4:00 pm in 303 Schrenk Hall

Accessing anionic and cationic redox in metal chalcogenides through building block approach

Abstract: Boosting the energy density of Li-ion batteries is of prime importance in the current era to meet the energy demands for electric vehicles (EV's). In this regard cathodes play an important role as the specific capacity is directly related to the number of Li-ions to be extracted from or inserted into the cathode as a function of redox. Towards achieving this goal, researchers are looking into combining both cation and anion redox in the new generation cathode materials. In this regard, we have developed building block approach of synthesis targeting specific compositions that can potentially act as candidate for cathodes and solid electrolytes. Through this technique we discovered two new polyanion sulfide-based cathodes with Cu^{+} and Fe^{2+} cations exhibiting high reversible specific capacities. Further their charge storage mechanism and structural stability were evaluated by spectroscopic (XAS and XPS) and diffraction studies (Synchrotron XRD). Following these works we also synthesized two new ternary selenide-based building blocks (Li_5MSe_4, M = Al & Ga) and measured their ionic conductivity. Aliovalent doping in these building block showed improvement in Li-ion conduction showing promises in search of potential solid electrolytes for Li-solid state batteries. At the end, an overall overview on chalcogen based materials and its optimization for energy storage devices will be summarized.