



# ME Department Seminar

## Electrical Energy Storage: Next Generation Battery Technologies



**Arumugam Manthiram**  
The University of Texas at Austin  
*Department of Mechanical Engineering*  
*Materials Science and Engineering Program*  
*Texas Materials Institute*

**Tuesday, December 12, 2017**  
**4:00 p.m.**  
**1200 EECS**

### **Abstract**

Rapid increase in global energy use and growing environmental concerns have prompted the development of clean, sustainable, alternative energy technologies. Electrical energy storage (EES) is critical to efficiently utilize electricity produced from intermittent, renewable sources like solar and wind as well as to electrify the transportation sector. Rechargeable batteries are prime candidates for EES, but widespread adoption requires optimization of cost, cycle life, safety, energy density, power density, and environmental impact, all of which are directly linked to materials challenges. After providing a brief account of the current status of lithium-ion technology, this presentation will focus on the development of new materials, cell chemistry, and cell configurations to overcome the current problems. Particularly, the challenges and approaches of transitioning from the current insertion-compound electrodes in lithium-ion batteries to new conversion-reaction electrodes with multi-electron transfer to increase the energy density and lower the cost will be presented. Specifically, lithium-ion technology based on high-nickel layered oxides as well as post lithium-ion technologies based on sulfur, oxygen, and mediator-ion solid electrolytes will be discussed.

### **Bio**

Arumugam Manthiram is currently the Cockrell Family Regents Chair in Engineering and Director of the Texas Materials Institute and the Materials Science and Engineering Program at the University of Texas at Austin (UT-Austin). He received his Ph.D. degree in chemistry from the Indian Institute of Technology at Madras in 1981. After working as a postdoctoral researcher at the University of Oxford and at UT-Austin, he became a faculty member in the Department of Mechanical Engineering at UT-Austin in 1991. Dr. Manthiram's research is focused on clean energy technologies: rechargeable batteries, fuel cells, supercapacitors, and solar cells. He has authored more than 650 journal articles with 37,000 citations and an h-index of 100. He is the Regional (USA) Editor of *Solid State Ionics*. He is a Fellow of six professional societies: Materials Research Society, Electrochemical Society, American Ceramic Society, Royal Society of Chemistry, American Association for the Advancement of Science, and World Academy of Materials and Manufacturing Engineering. He received the university-wide (one per year) Outstanding Graduate Teaching Award in 2012, the Battery Division Research Award from the Electrochemical Society in 2014, the Distinguished Alumnus Award of the Indian Institute of Technology Madras in 2015, and the Billy and Claude R. Hocott Distinguished Centennial Engineering Research Award in 2016.