

**Amgen Seminar Series in Chemical Engineering**  
in  
Cherry Auditorium, Kirk Hall, 12:45 PM

**Presents on November 7, 2019**

**Batteries: Why do we need them, and what are we doing about it?**

By



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Given the rapid rate at which the world consumes energy (~140,000 terawatt hours annually) our non-renewable sources, principally oil, natural gas and coal will, arguably, run out 'soon'. These sources also contribute to major greenhouse gas emission. Therefore, from both a resource perspective as well as reducing environmental pollution, renewable and clean energy sources must be developed. The most viable ones currently are energy from the sun and from wind, both of which are intermittent. That is, energy generated during 'on' hours must be stored to be used in 'off' hours. Batteries are a promising mode of energy storage, because they are efficient, clean and rechargeable.

For a variety of reasons that will be outlined, lithium ion batteries (LIB) are being used in electric vehicles, medical devices, unmanned propulsion systems and for stationary storage. The battery performance metrics for each of these applications are very different, posing a challenge to LIB manufacturers. Furthermore, substantial improvement in LIB energy density, power density, stability and safety will be required to meet future demands in all of these applications. Towards this end, our efforts are focused on the anode and the electrolyte used in LIBs. We use simple colloidal processing strategies combined with a range of analytical techniques to optimally configure multicomponent systems that are used in anodes to enhance their energy density. We are also developing methods for making solid polymer electrolytes as a potential non-flammable, and thus safe replacement for the currently used organic liquid electrolytes. In this talk, our efforts in these areas, as well as the many remaining challenges, will be reviewed.

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