Chemical Engineering in a Solar Energy Driven Sustainable Future

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March 7, 2012, 5:30-6:30pm
G124

Chemical engineering as a discipline evolved in the 20th century with the conversion and use of then abundantly available fossil resources, mainly coal, natural gas and crude petroleum. However, going forward the fossil resources are finite and economic growth, environmental concerns and political landscape are reshaping the availability as well as the manner in which these resources will be used. Ultimately a transition from fossil resource based state to a renewable energy based state is inevitable. Such a transition provides us the same level of dramatic opportunity and growth as experienced by chemical engineers during the early to mid part of the last century.

In this presentation we will focus on a future where the basic human needs of food, chemicals, heat, electricity and transportation will generally be met by solar energy. Transition from fossil resources to such a solar-energy-driven future provides an unprecedented opportunity for chemical engineers. Novel technologies and solutions will be needed to satisfy all the basic needs of daily human life. We will discuss some of these challenges and opportunities to satisfy chemicals, fuels and electricity needs.

In a solar-energy-driven world, it will be particularly challenging to satisfy the need of the transportation sector due to its requirement of high energy density fuel and associated ease of handling. Novel solutions to meet this challenge and sustain the current transportation sector will be presented. These solutions provide a feasible framework for a sustainable solar economy. They also provide exciting possibilities for Chemical Engineers to apply their expertise and contribute to the grand challenge of energy.