Mechanical Engineering Department Seminar

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1130 Mechanical Engineering
111 Church Street SE, Minneapolis, MN 55455

Trends in Thermal Energy Storage and New mPCMs for Buildings

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We consume fossil fuels faster than ever to meet our constantly growing greed for energy. Global energy demand is expected to grow by 37% in 2040 according to IEA World Energy Outlook – 2014. Over centuries, man has had the tendency to take things for granted. Alternative energy resources that must replace fossil fuels are renewables (solar, wind, biomass, hydro, geothermal), natural heat and cold from air, ground, surface water and oceans and waste heat from industrial processes. Most of these alternative sources possess an intermittent nature – a gap exists between their supply and demand. This gap can be alleviated by storage: i.e. thermal and/or electrical energy. 60-80% of the earth’s primary energy is used in heating and cooling. The major share of this demand is met by fossil fuels. Thermal energy storage (TES) systems promise to be the missing link for us to tap into alternative energy resources for heating and cooling applications. Today, there exist many applications of TES that use alternative energy resources, quite efficiently and affordably. This presentation will provide an overview of recent trends and challenges in TES and focus on research at Cukurova University to develop and apply new bio-based microencapsulated phase change materials (mPCM) for TES applications in buildings. Our approach involves the following steps: first determining and characterizing PCMs with suitable thermal properties; second developing a method to synthesize microencapsulated PCMs; and finally incorporate these materials in buildings for improving thermal comfort and energy conservation. We have succeeded in producing mPCMs within a diameter range of 70 nm to 950 nm. These mPCMs were designed to withstand mixing with coarse aggregates in concrete, while acting as thermo regulators. Seminar will be wrapped with future vision on TES systems and recommendations for material development.

Bio: Dr Paksoy is currently a professor in the Chemistry Department, and also the Director of the Center for Environmental Research at Çukurova University. She received a B.S. in chemical engineering in 1983 from the Bogazici University. She obtained the M.S. in 1986 and PhD in 1992 in physical chemistry from Çukurova University. She has been concentrating on thermal energy storage technologies since. Her main research is on fundamental and applied energy storage studies, as well as on developing thermal energy storage materials. She has directed a NATO advanced study institute on “Thermal Energy Storage for Sustainable Energy Consumption” in June 2005. She is associate editor responsible for energy storage in the International Journal of Solar Energy. She serves as the Turkish Delegate and current Chair of the Executive Committee of the Energy Conservation through Energy Storage Implementing Agreement of International Energy Agency.