

Energy Storage: Societal Needs and the Emerging Lithium-Air Technology

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The global energy requirements and environmental degradation due to accelerated use of fossil fuels have raised significant concerns worldwide. The global population is striving for a higher standard of living. Associated with the rising standard of living is the use of energy sources currently based on fossil fuels. These considerations have led several countries to initiate the development of alternate, renewable energy sources such as solar and wind. However, these energy sources are cyclic. It is apparent that the popularization and public acceptance of the renewable energy sources require the development of an efficient, inexpensive and safe energy storage technology.

An electrochemical energy storage device (battery) has been used for more than 200 years. During the last two centuries, several battery chemistries have been developed and commercialized. The most recent is the lithium-ion chemistry, which has become a multi-billion dollar industry in the past 30 years. It powers many devices ranging from portable electronics to electric cars. However, the safety features and energy density of the lithium-ion chemistry remain a matter of significant concern. The societal need calls for the development of transformational energy storage technology to power gadgets ranging from multifunctional, portable electric device to long-range electric cars.

In the context of complex societal issues, this presentation will address development of Lithium-oxygen/air battery chemistry. Theoretically the lithium-oxygen/air chemistry is capable of providing batteries with much higher energy density as compared to the state-of-the-art lithium ion batteries. The dual concerns of energy density and safety could be addressed by developing solid state batteries. There is a challenge before the scientific community to develop a transformational battery chemistry which provides both high energy density and safety even in aggressive environments. To address the challenge, a solid state lithium-oxygen/air chemistry is being developed at UDRI. The presentation will cover recent developments and future potential.