

## Cathode and anode materials for sodium-ion battery for large scale micro-grid applications

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Deployment of micro-grids using intermittent renewable energy sources such as solar and wind power requires energy storage systems. Large scale storage systems (250-1000 kWh) are useful for load shifting as well as frequency regulation.

Currently lithium-ion batteries are preferred for micro-grid applications but are expensive about \$800-1000/kWh. Besides, lithium is a scarcity and may not meet proliferating needs of the future especially in defense applications due to energy security. Sodium, on the other hand, is the sixth most abundant element on the Earth's crust. Sodium-ion batteries are still in the nascent stage but are expected to be safe and durable and predicted to be inexpensive (about \$250/kWh). Sodium based materials, besides being more environmental friendly, is also easy to recover - at a fraction of the cost of lithium based materials. Regardless of the lower energy density of sodium-ion batteries, they can be effectively employed for micro-grid applications, where the weight and footprint requirement are not severe.

In this talk, recent results on selected cathode and anode materials for Na-ion battery system will be presented. Strategies to improve the storage capacity, rate performance and cycle life would also be discussed.

### Biography

Palani Balaya, just after graduating (1987-1993) from Hyderabad University, India in the area of Solid State Ionics, joined at IISc, Bangalore as a Research Associate (1994-1996) and worked on thermal properties of insulating materials. He later joined at Inter University Consortium Mumbai, as a Scientist (1996-2001) and worked on amorphous materials. He then moved to Max Planck Institute for Solid State Research, Stuttgart as a Guest Scientist (2001-2006) and worked in the area of Nano-ionics. He joined as an Assistant Professor in the Faculty of Engineering, NUS in January 2007. His current research area includes energy conversion and storage.

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## Aqueous CuCds NIR quantum dots as theragnostic agents: Therapeutic efficiency mediated by chemo-photo-thermal therapy and *in vivo* deep tissue imaging

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Quantum dots (QDs) have garnered greater attention owing to their significant photophysical properties such as high fluorescence quantum yield (QY), superior stability against photobleaching, narrow and symmetric emission spectrum and broad excitation spectrum. These characteristic properties make QDs superior fluorescent probes to organic fluorescent dyes and proteins for *in vitro* and *in vivo* bioimaging applications. Among several imaging modalities, optical imaging techniques have attracted great interest in the diagnostic process due to their easy operation, better temporal resolution, and relative low cost. Since most tissue chromophores, including oxyhemoglobin, deoxyhemoglobin, and melanin, exhibit comparatively weak absorbance in the near infrared (NIR) spectral range (700-900 nm), intense research efforts have been placed on the development of NIR probes. In fact, NIR techniques have been intended to diagnose diseases, monitor the response to therapeutic treatment, track tumor development, and metastases, as well as to evaluate the rehabilitation. NIR optical imaging has also been applied on pharmaceutical research, such as monitoring the biodistribution of drugs, and visualizing the targeted delivery of drug carriers in living animal subjects. In our study, we report conjugation of targeted quantum dots to reduce cellular toxicity and for simultaneous chemo-photo thermal therapy in *in vitro* cancer cells. The biocompatible QDs were in turn used for the potential application as diagnostic tool for imaging mice (biodistribution). The cancer-induced mice were used to study the accumulation of QDs upon administration.

### Biography

Ravindran Girija Aswathy has completed her Ph.D. in Bio-Nano Science Fusion Course from Toyo University, Japan in 2012. Presently she is working as postdoctoral researcher in Bio-Nano Electronics Research Center, Toyo University. She has published several papers in reputed journals and her area of specialty is biocompatible nanomaterials for biological applications.

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