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Ferroelectric Coupled C-Sulfur Composite Cathode for High Rate Performance of Li-S Battery

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Lithium sulfur batteries with high charge-discharge rate capabilities are in great demand for hybrid vehicles, electric vehicles and portable electronic products. However uptill now its real applications are still plagued by rapid capacity fade mainly stemming from the polysulfide shuttle. High rate capability can be often enhanced by downsizing cathode materials to the nanoscale which increases the reaction surface to volume ratio but downsizing to less than 100 nm reduces the capacity. Ferroelectric materials have attracted much attention due to their unique ferroelectric, piezoelectric and ferroelastic properties. Coupling of highly polarized ferroelectric (BiFeO₃) layer is an approach that can be used to enhance the higher rate characteristics and trapping of shuttle mechanism because ferroelectrics provides higher polarization which help to build up an internal electric field and induces macroscopic charges on the surface of the cathode. In Li-S batteries during discharge polysulfide shuttle causes capacity fade of the battery. We can speculate that polysulfide's are heteropolar in which spontaneous polarization of ferroelectrics (BiFeO₃) may solve the shuttle effect and can trap its formation for high rate performance Li-S batteries.

Biography

Dr. Balram Tripathi is an Associate Professor at S S Jain Subodh P.G. (Autonomous) College, University of Rajasthan, Jaipur, India. He was awarded by University Grant Commission (UGC) in D. S. Kothari Scheme on SHI induced modification in luminescent semiconductor nanocrystals dispersed polymers for bioadaptability (2008-2011) India as a post doctoral fellow. He also got a Post doctoral Fellow (CNPq) award by Brazilian Centre for Physics Research (CBPF) at Rio de Janeiro (Brazil) (2010-2011) and Young Scientist award by DST New Delhi, SR/FTP/PS-096/2009 in Physical Science of Fast Track Scheme (2011-2014) India and Raman Fellow award by UGC New Delhi F.No.5-158/2016 in Physical Science (2016-17) at University of Puerto Rico, San Juan USA and Early Career Research Award by DST New Delhi F.No. ECR/2017/000655 in Physical Science (2017-2020).