Hybrid Ultracapacitor-Battery Energy Storage System for Autonomous Sensors

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Abstract

Novel materials are investigated to simultaneously enhance energy and power density of ultra-capacitors that are solvent-free for autonomous sensors. Hybrid energy storage / power delivery devices are desired because of their flexible design to accommodate different autonomous sensors format and a wide range of other applications. However, the current technology is expensive, less eco-friendly and meet stability problems [1].
In this regard, carbon material and clay composites are used here as a suitable material for anode with an ionic liquid as partner electrolyte. The carbon material selected is graphene, which is an interesting conductive material used in ultra-capacitors [2] and we propose to intercalate it with a clay such as montmorillonite, which is an innovative way to increase the ion conduction and improve the shaping process of the electrode [3].

References

[1] A. Lewandowski *et al.*, Journal of Power Sources 194 (2009), pp. 601–609
[2] Wan-Yu Tsai *et al.*, Nano Energy 2 (2013), pp. 403–411
[3] Y. Ma *et al.*, Electrochimica Acta 187 (2016), pp. 535–542

Figures

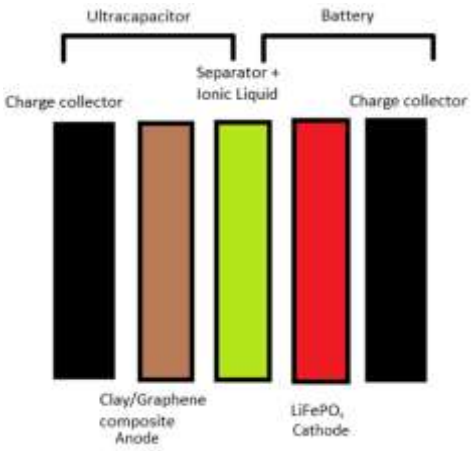

Figure 1: Design of energy storage/delivery device

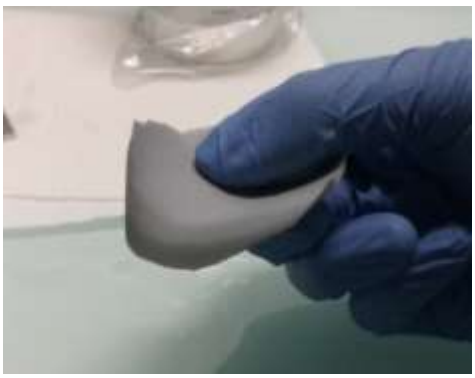

Figure 2: Clay/graphene composite free-standing film