

Thread based battery for low power e-textile applications

P. Laxmanan, G. Chitnis, R. Rahimi, and B. Ziaie
Purdue University, West Lafayette, IN

Textile electronic systems, or e-textiles, are on the rise but their utility is limited by its power demand. Potential applications include point-of-care diagnostic systems that would enable medical monitoring at the site of care. A small, inexpensive, and easy to use battery would enhance the capabilities of e-textile. Here we propose a thread based battery that attempts to satisfy these requirements. The thread based battery uses chemistry similar to an alkaline battery. The fabrication process involves patterning of current collector (silver epoxy or carbon ink) followed by zinc electroplating and manganese dioxide deposition. Thread present in between these two electrodes serves as the salt bridge. Chemicals needed for the redox reaction, e.g. ammonium chloride, can be impregnated in the thread in solid form. Single cell configuration of battery shows 1 V (open circuit) and up to 18 μ A current ($R=12$ k Ω). Multiple cells can be fabricated in series to achieve higher voltage output. The battery could be easily incorporated into textiles by methods such as sewing or knitting.