A step closer to 3D-Microbatteries for sensors: integrating polymer electrolytes

Muhammad E Abdelhamid [a], Anthony F Hollenkamp [b], Mike D Horne [a], Andojo Ong [c], Theo Rodopoulos [a], Thomas Rüther [b], Paulo de Souza [c], Jean-Pierre Veder [d]

[a] *CSIRO Mineral Resources, Research Way, Clayton VIC 3168, Australia*

[b] *CSIRO Energy, Research Way, Clayton VIC 3168, Australia*

[c] *CSIRO Data61, College Rd, Sandy Bay TAS 7005, Australia*

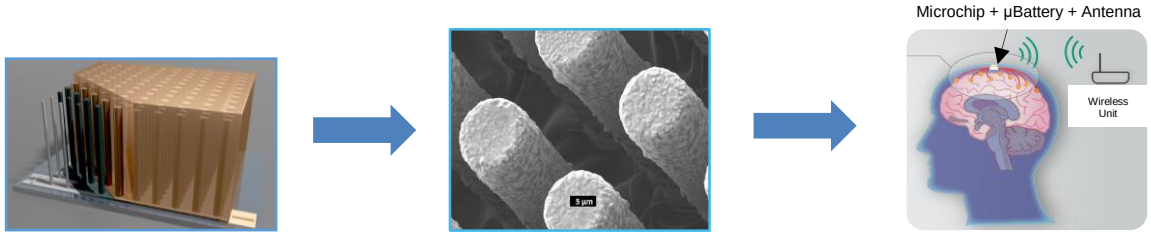
[d] *Curtin University, Bentley WA 6845, Australia*

E-mail: muhammad.abdelhamid@csiro.au

Small-scaled energy storage is a highly sought after technology for emerging miniaturised sensor systems. The burgeoning interest in sensor miniaturization is motivated by the potential implications in important application areas, such as autonomous and wireless microsensors (for health and environmental monitoring), and reconnaissance and surveillance microdrones (for defence & security)

The development of suitably small batteries is faced with the conundrum that as sensor platforms become smaller and smaller their power demand rises with ever increasing complexity and autonomous operation. For the battery component itself, the problem of 'limited real estate' arises which in turn leads to the undesirable effect of a reduction in the energy available to the miniature sensor systems. Energy storage is thus considered to be a major roadblock in the trend towards sensor miniaturisation.

To overcome the problem of diminishing energy storage capacity for a reduced housing space or footprint, CSIRO is developing a 3D-structured microbattery consisting of high surface area cylindrical pillar-shaped electrodes as the power block in a miniaturised multicomponent platform for medical implant applications. Here, we present our approach for assembling a 3D-structured device with a particular focus on the incorporation of an ion conducting polymer film which functions as the electrolyte (PEL) as well as a separator between the pillar-shaped electrodes. Notably, our approach allows the PEL film – a ternary composite of a polymer matrix, an ionic plasticiser and a lithium salt – to be applied thinly and contiguously to complex surface geometries. The effectiveness of the PEL to perform the desired functions was determined from electrochemical data. In addition, we also highlight our experimental methodology to address the challenges of manipulating and performing data collection from very small device components.



Vision *Realisation* *Application*

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