Novel Use of Bio-Based Materials in Metal-Air Batteries

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As we move into the future, increasing energy demands of technologies like electric vehicles have led to interest in more sustainable materials and more efficient battery systems. Bio-based materials are sustainable due to being safe, stable and inexpensive. Metal air batteries like Al-Air and Zn-Air have great potential as efficient energy devices, with high theoretical specific energies(8100Wh/kg and 1370Wh/kg). This project explores use of bio-based materials in metal-air batteries. Specifically, activated carbon was derived from waste banana peels via a facile two-step process of carbonisation and activation, for use in the cathode of these batteries. SEM of the carbon revealed surface characteristics suitable for the oxygen reduction reaction (ORR). Also, an enhanced solid-state polymer electrolyte was prepared from readily available gelatine. Polymer electrolytes can suppress the fast anodic corrosion that is problematic for such cells, and prevent leakages. Prototype cells were constructed using a stacked structure and subjected to testing, showing good specific energy, which is important for energy storage devices. They demonstrated the potential for wider application of bio-based materials in construction of safe and effective batteries. The novelty of this project lies in the unique use of banana peel carbon in these batteries and a solid state biopolymer electrolyte in the Al-Air system. The inexpensive and environmentally friendly processes and materials used lend great promise to the potential for the future of these batteries.

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