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Paper: Sustainability

Electrical batteries from plantain pith

An electrical battery is an electrochemical cell that converts stored chemical energy into electrical energy. Commercially available batteries contain heavy metals such as mercury, lead, cadmium, and nickel, which contaminate the environment when batteries are improperly disposed. Also, they are very expensive to be used for long term lighting purposes. Recently, Golberg et al [1] reported a significant performance improvement in a Zn/Cu-potato galvanic cell. The objective of this study is to find a cheap biodegradable material to fabricate an environment-friendly, low cost battery.

In this investigation, the performances of vegetative Galvanic cells made from locally available tubers/yams were studied. The cell was fabricated by sandwiching tissues made out of different types of tuber/yam slices between parallel Zn and Cu plates of area 5×9 cm^2. Performance of the cell was optimized by changing the separation between the electrodes (different thicknesses of tuber/yam slices). A preliminary study revealed that cells made with plantain pith and *habarala* petiole show better battery performance. Untreated, boiled, and chopped after boiling states of plantain pith and *habarala* petiole were further tested in order to enhance the battery performance. Best battery performance was obtained from chopped plantain pith after boiling. Stability of the battery fabricated with chopped plantain pith after boiling was tested by measuring the light intensity of a normal white LED with time. Results revealed that it is possible to light up LEDs for more than 500 hours provided the electrolyte is prevented from drying.

Considering the cost and abundance of the material, plantain pith is a very good candidate for the electrolyte medium of the batteries, although the electrical performances of the plantain pith batteries are slightly lower than potato batteries. In conclusion, it is possible to fabricate a battery easily from cheap and environmentally friendly material of plantain pith for low power applications.

[1] Alex Golberg, Haim D. Rabinowitch and Boris Rubinsky, *J. Renewable and Sustainable Energy*, **2**, 033103 (2010).