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A membrane less single compartment abiotic glucose fuel cell

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A simple energy harvesting strategy has been developed to selectively catalyze glucose in the presence of oxygen in a glucose/O2 fuel cell. The anode consists of an abiotic catalyst Al/Au/ZnO, in which ZnO seed layer was deposited on the surface of Al/Au substrate using hydrothermal method. The cathode is constructed from a single rod of platinum with an outer diameter of 500 µm. Direct bioelectrocatalysis was demonstrated for the Al/Au/ZnO anode, which was evidence by the generation of anodic current in the presence of glucose. The abiotic glucose fuel cell was studied in phosphate buffer solution (pH 7.4) containing 5 mM glucose at a temperature of 22° C. The cell is characterized according to its open-circuit voltage, polarization profile and power density plot. The characteristics are comparable to biofuel cell utilizing a much more complex system design. Such low-cost light weight abiotic catalyzed glucose fuel cells have a great promise to be optimized & miniaturized to power bio-implantable devices.

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Gasification of raw, torrefied and carbonized cotton stalks: Impact on energetic performances and tar content

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The present study is focused on the gasification of raw, torrefied and carbonized cottons stalks (CS). The mass and energy balance, energy efficiency, LHV and tar content of gas had been investigated according to the biomass type (raw, torrefied and carbonized). A low content of hydrogen and oxygen in the torrefied and the carbonized CS had led to a low fraction of H_2 and CH_4 during the gasification. Despite an increase of CO from 10.96 to 19.73% for raw and pretreated CS, the results show a decrease of energy efficiency and LHV of the gas for torrefied and carbonized CS. The lowest energetic performances (LHV of 2812 kJ/Nm^3 and 34% of energy efficiency) were found during the gasification of torrefied CS. However, 0.10 g/Nm^3 and 2.24 g/Nm3 of tar are produced for the gasification of carbonized and torrefied CS respectively against 4.41 g/Nm^3 for the gasification of raw CS.

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