Biofuel cell retrieves copper

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(PhysOrg.com) -- Producing energy and recovering copper from waste water at the same time: this is what Wageningen University environmental technologists are doing with their new microbial fuel cell.

'We obtain quite a lot of electricity from the process. In addition, copper dissolved in water is turned into a layer of copper on the electrode of the microbial fuel cell', says Annemiek ter Heijne, who published the basic principles of the microbial fuel cell in *Environmental Science & Technology* in the beginning of June.

In microbial fuel cells bacteria grow on anodes. They break down the organic waste in water and produce electrons. These electrons transmute the copper solution in the water into solid copper on the cathode of the fuel cell. Here an orange layer emerges which consists of pure copper. To make this process possible a special type of membrane is needed that regulates the pH value in the fuel cell.

Ter Heijne has now described the principles underlying this microbial fuel cell. Further research is needed to scale up and apply the process. She is thinking of applying the process in Chile, for example, to purify waste water from the copper mines and simultaneously convert biomass into energy.

An elegant feature of the microbial fuel cell is that it enables environmental technologists to vary the extraction of copper and energy. Under oxygen-free (anaerobic) conditions 85 percent of the electrons produced by bacteria reclaim copper in solid form; under oxygen-rich

(aerobic) conditions this is only 43 percent. In the latter case the fuel cell produces more energy.

'If your particular aim is to remove copper, it's better to work under oxygen-free conditions. But if you want to produce electricity, you have to add more oxygen', says Ter Heijne. The energy output of her prototype is high. Her guess is that copper acts as a catalyst in the production of energy.

Provided by Wageningen University

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