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Use Of Bioelectrochemical Systems For The Domestic Wastewater Treatment And Reuse

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Abstract

The goal of this study was to evaluate the potential of bioelectrochemical systems (BES) for domestic wastewater treatment and reuse.

BES are systems capable of using microorganisms as catalyst on electrodes for power generation from water contaminants removal.

The BES are a promising sustainable technology that could be used for sewage treatment to allow its reuse, since studies verified the capacity of BES to produce energy, remove organic matter, nutrients and pathogens from sewage, and produce low waste quantities.

Introduction

Domestic wastewater — *Liquid discharges from non-industrial anthropic sources (e.g. residences, commercial establishments, institutions)*

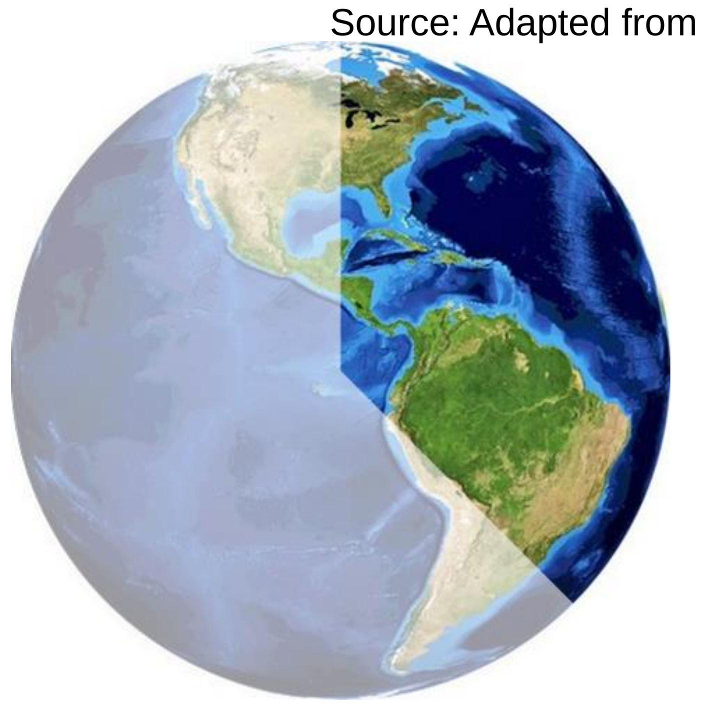
Sanitation — *Collection and treatment of domestic wastewater*

Human right — *Sanitation as an essential human right to an adequate standard of living for all and to the realization of all human rights (UN, 2010).*

Source: Adapted from Polistore (n.d.).

2.3 billion *without basic sanitation*

(WHO, 2017)



2/3 *face water scarcity at least one month per year*

(UN-WWAP, 2017)

Source: Adapted from Abreu (2020); Alves (2020); ECAS (n.d.); Fenatema (2020); RSL (2018); Sergipe (2016); Schons (n.d.).

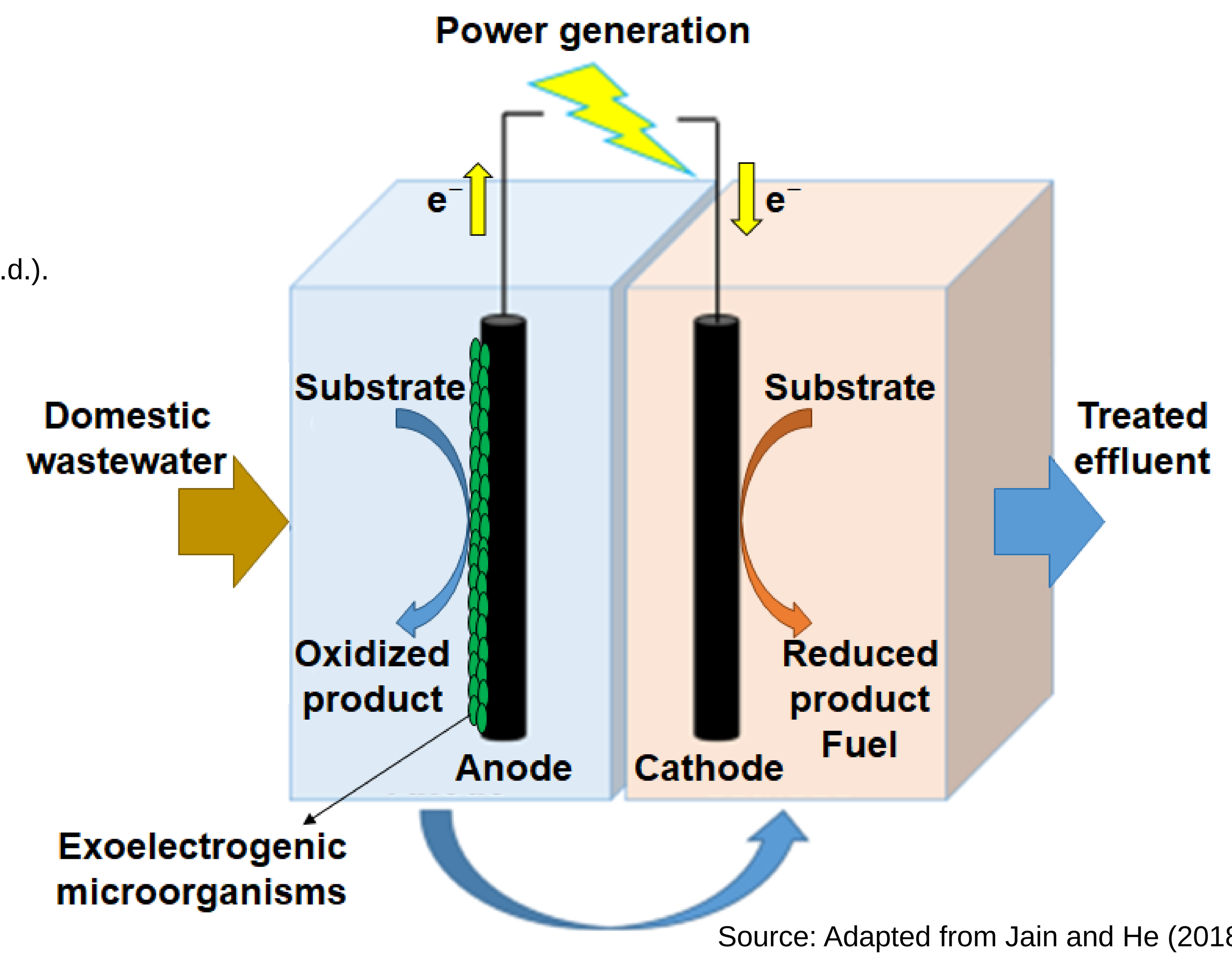
Domestic wastewater treatment for water reuse

Source: UN (n.d.).

BES

- may be a sustainable alternative to treat domestic wastewater
- reducing demand for fossil fuel
- reducing CO2 emission

Bioelectrochemical Systems



Source: Adapted from Jain and He (2018).

Findings

Gajaraj and Hu (2014):
- Integration of a BES into a conventional wastewater treatment
- Reduction of 11% of sludge production

Lu, Abu-Reesh and He (2016):
- Synthetic wastewater treatment by a BES
- Removal of >90% of the organic matter, 75% of ammoniacal nitrogen and 52% of salinity

Chen et al. (2017):
- Domestic wastewater treatment by a BES
- Removal of >95% of organic matter, nitrogen and phosphorous

Liang et al. (2018):
- Domestic wastewater treatment by a pilot scale BES
- Removal rate of 70-90% of organic matter
- Power generation of 0.033 kW/m³

Pérez-Rodríguez et al. (2018):
- Municipal wastewater treatment in a pilot scale BES
- Removal of 92% of organic matter, 96% of helminth eggs and 99% of fecal coliforms

Kumar and Singh (2020):
- Municipal wastewater by a BES integrated with constructed wetland
- Removal of 64-96% of nitrogen, 50-91% of phosphate, 58-88% of sulphate, 73-85% of organic matter
- Power production higher than the consumption in the BES.

Conclusion

The BES are a promising sustainable technology that could be used for domestic wastewater treatment to allow its reuse.

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