Bio-electrochemically assisted recovery of nutrients from urine

Motivation

There is a need for fertilizers in agriculture to ensure sufficient food production. These fertilizers are mainly made from phosphorus (P) and ammonia (NH₃). P is limited and scarce and NH₃ comes from energy-intensive processes, such as the Haber-Bosch process.

Urine is a potential source of the nutrients. It contributes to 80% of the nitrogen (N) and 50% of the P load in conventional domestic wastewater. Its high N and P concentration compared to normal sewer water enables a more effective and energy efficient recovery. Additionally, the nutrient load to the wastewater treatment plants is lowered and the water consumption reduced by the use of separation toilets or water free urinals.

Technological challenge

The aim is to develop, demonstrate and evaluate an innovative and energy-efficient bio-electrochemical system (BES) that allows for the recovery of valuable nutrients (P and NH₃) from urine while producing chemicals (NaOH, KOH) and, electricity or hydrogen (H₂) (Fig. 2 and 3).

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