Hanspeter Zöllig wins the 2016 Otto Jaag Water Protection Prize

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Hanspeter Zöllig has been awarded the 2016 Otto Jaag Water Protection Prize for his dissertation entitled “Electrolysis for the Treatment of Stored Source-Separated Urine”, which examined how electrolysis can be employed to recover nitrogen from urine. The prize recognises excellent PhD theses and masters dissertations in the fields of water protection and hydrology.

Hanspeter Zöllig’s dissertation supervisors at Eawag were Kai Udert and Eberhard Morgenroth, in the department of Process Technology. The dissertation indicates that the process of nitrogen retrieval from urine by means of electrolysis is a very complex one. Electrolysis does, however, have some advantages over other urine treatment technologies, including the fact that it does not require additional chemical substances, and the fact that it achieves very high substance conversion rates. The only additional requirement is a supply of energy in the form of electricity. This makes electrolysis easy to automate, which makes it a particularly attractive option for decentralised urine treatment in developing countries, as well as for the water protection cause in those places.

In order to reclaim ammonium nitrate from urine, the nitrogen present in the form of ammonium must first be oxidised to 50% nitrate. The electrochemical ammonium oxidation takes place in two ways: either directly at the electrode, or indirectly via active chlorine compounds that are formed from the chloride present in the urine.

Hanspeter Zöllig demonstrated that indirect oxidation is very rapid. However, it also gives rise to carcinogenic, chlorinated substances that are primarily formed in the gas phase. These have to be removed in order to avoid negative environmental consequences. Direct ammonium oxidation, on the

other hand, prevents the generation of chlorinated substances, and has the benefit of requiring less energy. Zöllig demonstrated this using inexpensive graphite electrodes. Both methods of oxidation investigated, however, mostly produced elementary nitrogen (70%) rather than nitrates (30%). Electrolysis in urine treatment is therefore more useful for the elimination of nutrients as opposed to their retrieval.

Hanspeter Zöllig is currently working part time on the Swiss Water Association's platform for Micropollutants Process Engineering. From July 2017, he intends to devote himself to other challenges in the area of wastewater treatment.

https://www.eawag.ch/en/info/portal/news/news-archive/archive-detail/hanspeter-zoellig-wins-the-2016-otto-jaag-water-protection-prize

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