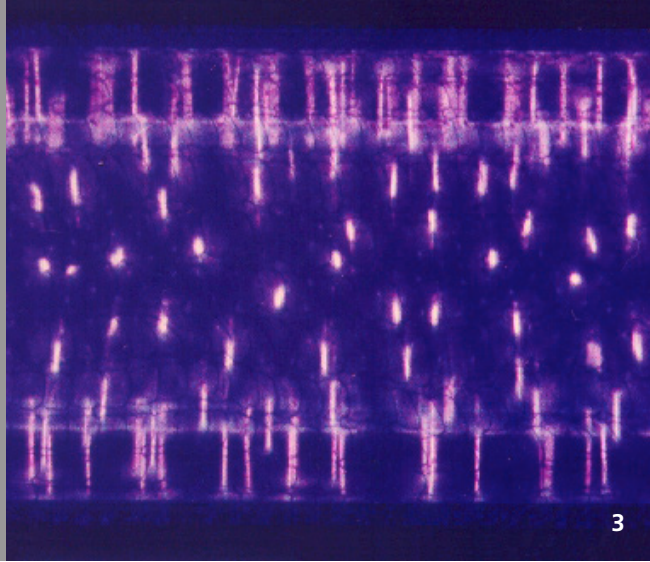


2



3

INNOVATIVE PLASMA PROCESS FOR THE REMOVAL OF POLLUTANTS IN WASTEWATER

Task

Society faces new challenges and needs innovative processes for wastewater treatment as our waters are becoming more polluted and thus our drinking water supply threatened by pollutants that are difficult to decompose. Today, pollutants resistant to biodegradation in the classical activation process can only be degraded in very few sewage treatment plants, ones that treat the wastewater with ozone or the use of activated carbon.

Method

In cooperation with the Institute of Environmental Engineering (ISA) at RWTH Aachen University, Fraunhofer ILT carried out initial experiments to degrade diclofenac (DCF) and the X-ray contrast medium amidotrizoic acid (ATZ) in a new process with combined plasma and UV treatment. Bombarding a reactor of the wastewater with reagents from the plasma (ozone, OH radicals) and UV radiation (here, excimer radiation at 222 nm) promises to consume significantly less energy to degrade pollutants while avoiding chemical substances due to the synergistic effect. In a reactor, a cascade of plasma filaments is generated in the electrical field of the applied high voltage in both, the UV chamber and the chamber with the wastewater to be treated (see Figure 2).

Results

First experiments showed a decomposition rate of 80 percent for ATZ in a mixture of DCF and ATZ for an estimated energy requirement of 4 kWh per cubic meter of wastewater. The simultaneously determined rate of degradation of DCF was significantly greater, and the energy requirement for an equal rate of degradation of 80 percent significantly lower. The target value of 0.2 kWh/m³ seems realistic, based on the data from the preliminary experiments and the optimization potential, e.g. with the electrical parameters or the reactor geometry. This target value results from a comparison to wastewater treatment with ozone, which is currently the state of the art. Pollutants such as DCF or ATZ are only degraded at a much lower rate.

Applications

Possible fields of application of this method are in sewage treatment plants or decentralized facilities of heavily polluted wastewater.

Contact

Dr. Klaus Bergmann
Telephone +49 241 8906-302
klaus.bergmann@ilt.fraunhofer.de

apl. Prof. Reinhard Noll
Telephone +49 241 8906-138
reinhard.noll@ilt.fraunhofer.de

- 2 Schematic diagram for wastewater treatment with cascaded barrier discharge.
- 3 Coaxial reactor with barrier discharge.