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FRAUNHOFER INSTITUTE FOR ENVIRONMENTAL, SAFETY, AND ENERGY TECHNOLOGY UMSICHT

PHOSPHOR-RECYCLING BY HIGH-POWER ULTRASOUND

INNOVATIVE TECHNOLOGY

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Sewage sludge as well as other biomasses contain valuable resources like nitrogen and phosphor compounds which are used as fertilizer in agriculture. Especially the recovery of phosphor out of sewage sludge plays an essential role and is in the future also required by law. Here a new and innovative ultrasound technology offers promising approaches.

With regard to this Fraunhofer UMSICHT and its partners develop and optimize a process concept including the disintegration by high-power ultrasound. Following process steps than enable an almost complete recovery of valuable resources.

Keywords

- Recovery of nitrogen and phosphor compounds
- Disintegration of sewage sludge by high-power ultrasound
- Separation of sewage sludge into:
  - Fiber fraction
  - Hydrogel fraction
  - Liquid phase

Industrial Sectors

Wastewater and environmental industry:

- Wastewater treatment plant
- Biogas plant
- Further biomasses like algae
- Fertilizer industry

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1 *Ultrasound transducer and sonotrode. BSonic*

2 *Ultrasound device Cavit2. BSonic*

Technological specification

High-power ultrasound:

- Patented ultrasound technology (magnetostrictive) enabling oscillation amplitudes of up to 100 µm at high power
- Cavitation and bubble implosion causing cell disruption

Mechanical separation into three process streams:

- Cellulosic fiber fraction
- Nutrient-rich hydrogel fraction
- Liquid phase containing nitrogen and phosphor compounds

Recovery of valuable resources:

- Nitrogen and phosphor compounds by precipitation (MAP) and ammonia stripping
- Fast fermentation of liquid phase
- Utilization of hydrogel fraction by drying
- Further treatment of fiber fraction like HTC

Our service

With regard to ecologic as well as legislative reasons an almost complete recovery of phosphor out of sewage sludge will become a crucial matter in the future. Therefore, Fraunhofer UMSICHT does application-oriented and practical research. We would like to support and advise you concerning:

- Application potential of innovative disintegration process by high-power ultrasound
- Analysis, optimization and development of process steps for an almost complete recovery of valuable resources
- Lab and pilot testing in order to identify optimum utilization strategies
- Ecological balance of the entire process from the raw material to the fertilizer product

Your benefit

- Optimum recovery of valuable resources like nitrogen and phosphor compounds
- Treatments and process steps in order to almost completely utilize process streams
- Faster fermentation of liquid phase for methane production
- Compliance with legislative obligations for the recycling of phosphor