Recovery of Indium and Gallium from low-concentrated semiconductor production wastewaters

FIELD OF APPLICATION
Weakly concentrated industrial wastewaters are an important secondary source of gallium and indium that can - when exploited economically - contribute to secure the supply with strategic raw materials.

The technology enables the extraction of Ga and In from semiconductor industry wastewaters that occur during the production of GaAs, GaN, InP or InGaP wafers, ITO or CIGS.

Target users are companies in the field of - wafer production, - semiconductor processing and - high-tech metal recycling.

TECHNOLOGY
The technology utilizes the highly specific binding properties of special organic complexing agents (bio-ligands) towards the target metals Ga or In in aqueous wastewater solutions (‘lock-and-key’ mechanism).

This interaction makes it possible to remove Ga and In extremely selectively from low-concentrated (1-300 mg/L) wastewater, which contains many other metallic impurities at even higher concentration than the target species.

The applied bio-ligands are organic molecules produced by microorganisms.

The Ga/In-containing complexes are subsequently separated from the effluent by means of chromatography, nanofiltration, foam fractionation or immobilization in a gel matrix.

The key aspects for the process economics of this recovery technology is the value of the target metal and recycling rate of the bio-ligand. Recovery rates of Ga and In as well as of the bio-ligands of more than 95% could be obtained.

CUSTOMER VALUE
Depending on the amount of production wastewater, up several tons of Ga or In per year can be recovered from the customer's own effluents. This way a saving of critical and expensive raw material and a reduction of production costs can be achieved.

NEXT STEPS
- signing of non-disclosure agreement,
- detailed technological discussion,
- testing of company's wastewaters at our lab,
- viability study.

Your benefits
- Secure supply with strategic high-tech metals
- Exploration of secondary sources for raw materials
- Material savings
- Reduction of production costs

Stage of development
- Validated for GaAs wafer production wastewaters
- Currently TRL 4 (1 L per day)
- Up-scaling process running
- 10 L per day within 6 months
- 100 L per day until end of 2019

Patent status
- Patent application (04/2018):
  „Rückgewinnung von Metallen aus Industrieabwässern geringer Metall-Konzentration“

Offer of cooperation
- Development cooperation (customer specific process development, upscaling, exploration of new applications)
- Licence agreement

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