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Newsletter der bifa Umweltinstitut GmbH

bifa Umweltinstitut

Focus on CO_2 capture in Waste-to-Energy Plants

Session at the IFAT Orange Stage

A session organised by bifa Umweltinstitut and the Bavarian Ministry of the Environment at IFAT analysed how thermal waste treatment plants can contribute to net greenhouse gas neutrality.

The capture of CO_2 from waste incineration plants is currently the subject of intense debate among experts. There is a consensus that a number of technical, economic and legal challenges need to be overcome. This was also the subject of an IFAT panel event organised by bifa Umweltinstitut and the Bavarian State Ministry of the Environment and Consumer Protection.

Technical processes such as amine scrubbing, potash scrubbing and the oxyfuel concept as well as aspects of European and federal law were discussed. An important key message from the event was that the capture and provision of CO_2 from modern waste inciner- >>

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>> ation plants can be seen as an opportunity for a circular carbon economy.

There are still numerous tasks to be solved along the way, such as the further development of capture processes, increasing energy efficiency and the availability of renewable energies as well as logistics solutions for the CO_2.

The expert discussion was attended by Robert Winkler, Head of the Climate Protection, Policy and Sustainability Department at the State Ministry, Dr Ragnar Warnecke, Chairman of the Board of ITAD (Interessengemeinschaft der Thermischen Abfallbehandlungsanlagen in Deutschland e. V.) and Managing Director of GKS-Gemeinschaftskraftwerk Schweinfurt, Dr Wolfram Dietz, Project Manager at bifa Umweltinstitut and Dr Ling He from the Federal Environment Agency (UBA).

The packed audience and around 160 participants demonstrated a high level of interest in the topic.

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Presentation at the 21st VDI Conference on Firing and Boilers

Mathematical-physical model for the prediction of high-temperature chlorine corrosion in waste incineration plants

Together with Dr Sebastian Pentz (University of Augsburg), Dr Matthias Hämmer presented a 'corrosion model' at this year's VDI conference 'Firing and Boilers – Coatings and Corrosion – in Large Combustion Plants'.

This was developed as part of the IGF project 21352 N 'Reduction of high-temperature chlorine corrosion to increase energy efficiency when using alternative fuels' (duration 2021-2023). In detail, this is a mathematical-physical model for the calculation and prediction of steady-state high-temperature chlorine corrosion of superheater tubes in power plants with alternative fuels.

Dr Matthias Hämmer (bifa Umweltinstitut GmbH)

High-temperature chlorine corrosion as a limiting factor

High-temperature chlorine corrosion is one of the main limiting factors for the service life and operating temperatures of power plants using alternative fuels such as domestic waste, substitute fuels or biomass. Since the aim of the plants is to utilise energy, the flue gas flow contains complex systems for heat extraction that are exposed to the corrosive flue gases and are therefore subject to severe corrosion – such as the final superheater tubes, which are particularly exposed to the flue gas.

In thermal power plants, increasing the pressure and temperature of the steam results in higher efficiency and therefore a reduction in specific CO_2 emissions. However, by increasing the performance-relevant parameters, the formation of deposits and thus the corrosive attack increase exponentially. High-temperature chlorine corrosion results in damage to the superheater tubes and thus in limited travel- >>

>> ling times and downtimes, and in the worst case also in unplanned outages. This significantly increases system downtimes as well as maintenance and repair costs.

Planning tool for plant operators

The corrosion model presented now makes it possible to predict the corrosion attack as a rate of erosion on the steel of the superheater tube depending on the operating conditions. This makes it suitable as a planning tool for plant operators. The model is made up of six quantitative sub-models (flue gas aerosol, deposition, sulphation, gas phase diffusion, solid state diffusion, corrosion attack) and is based on laboratory and plant tests from the current project and a large number of previous projects as well as other data from the scientific literature.

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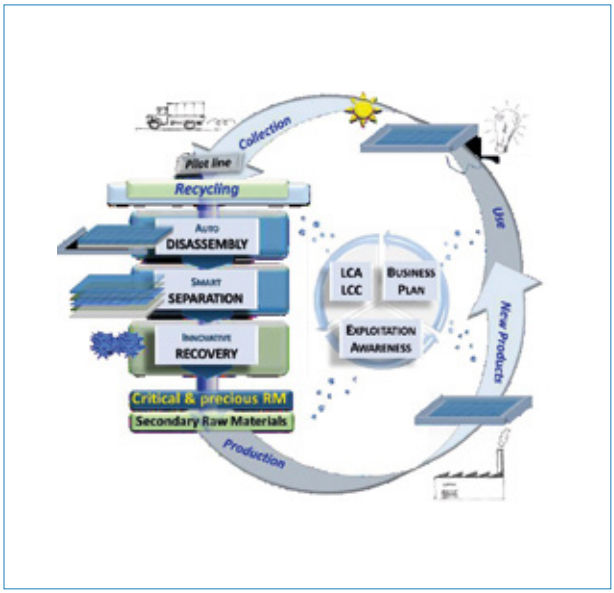
PHOTORAMA

An integrated technology approach for the recovery of critical raw materials and the recycling of PV modules

Due to the expansion of solar power, the quantities of PV modules installed have risen sharply and are expected to continue to increase. These will become input material for the project at the end of their useful life. The critical raw materials contained in the modules (In, Ga, Al, Si, Ag) are to be recovered for the economic cycle.

The project has developed processes for gentle skimming, delamination and recovery of valuable materials. Project results to date demonstrate the functionality of the approach. The recycled silver, for example, is almost comparable to the primary material used in module production.

PHOTORAMA concept



bifa is supporting this project with life cycle analyses by creating various scenarios and life cycle inventories. Furthermore, waste streams and market data are collected, classified and evaluated and the achievement of an improved circular economy is measured with an indicator.

European Sustainable Energy Award 2024

A pilot plant with the process steps of skimming, delamination and recovery is currently being set up in Sachsen-Anhalt. At the beginning of June 2024, the project was honoured with the European Sustainable Energy Award 2024 in the 'Innovation' category.

The project is funded by the European Union Horizon 2020 programme under grant number: 958223.

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KURZ INFORMIERT

Veranstaltung

ICARUS – Workshop, October 2024

In the EU Horizon project ICARUS, 17 partners under the coordination of SINTEF, Norway, are working on eco-efficient refining routes for secondary raw materials from the production of silicon ingots and wafers in order to open them up for demanding and high-quality markets.

Contents of the workshop

What are the target markets? What are the strengths, weaknesses, opportunities and risks associated with these markets? What works well within the individual supply chains? What are the challenges?
What added value will this project create for the participants and Europe?

Sensors make KLUGA

Adaptation to climate change through Internet of Things (IoT) sensors

Sensors have become an integral part of climate change adaptation research and their applications are diverse. For example, they are used on a larger scale to validate models as part of the identification of heat hotspots, to monitor water levels or to measure soil moisture for efficient irrigation management.

Together with our partners from the University of Ulm and the Digital Agenda of the City of Ulm, bifa has identified and prototyped use cases for sensors in the context of climate change adaptation over the past two years as part of the KLUGA project funded by the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection. The investigation focussed on the needs and interests of Ulm's civilian population.

KLUGA networking meeting: sensors in the context of climate adaptation and LoRaWan

Internet of Things (IoT) sensors

As a result, ten installed IoT sensors send small amounts of data several times a day to the city of Ulm's data hub via the LoRaWAN (Long Range Wide-Area Network) available in Ulm. The data is made freely available on a website that is clearly organised and enriched with important background information on a daily basis *(https://citysens.app/p/kluga/)*. The target groups addressed include athletes, children and senior citizens. The aim is to raise awareness and adapt personal behaviour to climate change.

In the long term, the data can help to document changes and monitor the effects of shading measures, for example.

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SMARTLINE-PV

Fast plasma-assisted perovskite crystallisation for highly efficient lead-free perovskite thin-film photovoltaics

Metal halide perovskite solar cells have become the focus of energy material research due to their high efficiency. Tin halide perovskites have emerged as a promising alternative to the use of lead.

The project is developing a robust thin-film technology with high efficiency and stability in a roll-to-roll process.

process. This results from the implementation of a fast, robust and scalable plasma-assisted crystallisation technology that leads to high-quality tin perovskite layers. The lead-free thin-film photovoltaic technology developed as part of SMARTLINE-PV will achieve efficiencies of 20-25%, while significantly reducing energy consumption and manufacturing costs compared to other thin-film technologies. Applications will include building-integrated photovoltaics with coloured versions of the products.

Together with the project partners, bifa is working on issues such as resource availability, eco-design, recycling-friendly design, circular economy and social acceptance throughout the entire development process, which is to be validated through the production of BIPV demonstrators and their operation under real conditions.

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