

ESPP events		1
ESPC5 call for abstracts open to 30 th May. NERM Nutrients in Europe Research Meeting, 16-17 April	1 2	
EU consultations		2
EU public consultation on recycled nitrogen products under the Nitrates Directive EU survey on Horizon Europe R&D Work Programme	2 2	
Policy		3
CEN seeking expert on fertilisers testing Summary of EU Fertilisers Expert Group 15-16 April 2024 Use of Category 1 Animal By-Product ash as fertiliser European Commission update on Cat.1 ABP ash, algae grown in manure EU regulation on animal by-products (ABPs) should be fundamentally reviewed Differences between Netherlands and EU fertilisers regulations	3 4 5 5 5	E
ESPP is looking for advice / support on Al		5
Nutrient recycling Benefits, perspectives and challenges of digestates Ostara struvite approved for EU Certified Organic Farming N2 Applied and Felleskjøpet Agri cooperative to implement N-recycling	6 6 6	6
Research and innovation		6
Struvite can be used in powder fire extinguishers PFAS removal in pyrolysis	6 7	
Stay informed & ESPP members		7

ESPP events

ESPC5 call for abstracts open to 30th May.

ESPC5, the 5th European Sustainable Phosphorus Conference, 8-9 October, Lleida, Spain (site visits 10th October) will focus on the climate and eutrophication challenges of phosphorus management in the Mediterranean and on synergies with anaerobic digestion of manure (Catalunya is a major livestock production region with proactive biogas development policies). Field visits: Fertilizantes del Ebro, biogas plant with digestate valorisation. ESPC5 will also celebrate the 10th



Birthday of ESPP, and look at progress and perspectives ten years on from the first ESPC Conference in 2013.

ESPC5 follows on from ESPC4 Vienna, 2022 which, with 320 participants onsite and 80 online, was the biggest conference on phosphorus ever worldwide.

- ESPC4 Vienna 2022: SCOPE Newsletter n°143
- ESPC3. Helsinki 2018: SCOPE Newsletter n°127
- ESPC2, Berlin 2015: SCOPE Newsletter n°111
- ESPC1, Brussels 2013: SCOPE Newsletter n°092

Abstracts for ESPC5 are invited by 30th May 2024 on:

- Phosphorus management in agriculture: P losses in agriculture, P use efficiency.
- Climate change impacts on P in the environment and on P management
- Phosphorus sustainability in the Mediterranean region
- Nutrient recovery technologies, recycled nutrient markets
- Digestate processing and valorisation
- Regional P sustainability policies
- Other aspects of phosphorus management and nutrient recycling

Abstracts for oral and posters: free format, must include: short title, names and emails of all authors, summary of maximum 500 words. ESPP members can take a short pitch, presenting company technologies or R&D perspectives. Send to info@phosphorousplatform.eu by 30th May 2024.

ESPC5 is organised by <u>BETA technological Center</u> (University of Vic), with support of ESPP and of the Catalunya Region. Lleida is one hour train from Barcelona. Full programme, conference fees, registration link (will open soon), travel information: https://www.phosphorusplatform.eu/espc5.



NERM Nutrients in Europe Research Meeting, 16-17 April

ESPP's NERM Nutrients in Europe Research Meeting brought together nearly 200 participants in Brussels, online, for research PhD students' pre-meetings, posters, parallel sessions and for a policy meeting with the European Commission. The conference was organised with the five Horizon2020 projects Fertimanure, Lex4Bio, Walnut, Sea2Land, Rustica. The conference showed that a wide range of research continues around nutrient recycling, in particular looking at new or improving known nutrient recovery technologies, further demonstration of agronomic performance of recycled nutrient products (noting the need for long-term field trials), environmental and LCA aspects. Conclusions noted the need for better information about nutrient recycling and organic fertiliser processing, products, markets; information of farmers; regulatory complexity and policies. The conference included a site visit to the BioSterco farm, treating over 5 000 t/y of manure (its own pig manure and from nearby farms) by nitrification/denitrification with Detricon nitrogen recovery from the manure (recovering ammonium salt solution) with production of a solid organic fertiliser and of purified water (reverse osmosis).

NERM, Brussels & online, 16-17 April, including site visits.

A full summary of the conference will be published as an ESPP SCOPE Newsletter soon.

EU consultations

EU public consultation on recycled nitrogen products under the Nitrates Directive

Public consultation to 17th May on amendment of Annex III of the Nitrates Directive to allow certain recovered nutrient products to be exempted from the 170 kgN/ha spreading limit. This limit is applicable for "manure ... even in a processed form" in Nitrate Vulnerable Zones, whereas synthetic fertilisers generally have a higher spreading limit. The Commission's proposed amendment partly takes the <u>JRC "Renure" proposals</u>, but allows only three eligible recovered products: ammonium salts from gas scrubbing, "mineral concentrates" from reverse osmosis, precipitated struvite. The proposed criteria also specify that the manure processing must have increased the mineral-N and that the resulting products must be of "consistent quality".

This is presented as an "interim solution". By limiting to these three specific recycled nutrient products, the proposal avoids the fact that the JRC Renure criteria (total N must be \geq 90% mineral, or ratio organic carbon / total N < 3), without other criteria, would be difficult for Member States regulatory authorities to verify (would be passed by raw manure spiked with urea) and would allow scarcely processed manure and some raw manure fractions.

The proposal includes additional requirements: copper and zinc limits, pathogen limits, quality control, labelling requirements, and also requirements which would appear to require specific modifications of NVZ Action Plans wherever these recovered products are to be authorised > 170 kgN/ha: tightening land application limits for all fertilisers, prevention of air emissions, specific consideration of the authorised products in Action Plans, especially as regards Natura 2000 and drinking water abstraction. Also, authorisation of the recovered products requires that "Member States ensure that livestock numbers and manure production do not increase as a result".

Commission Directive amending Annex III of the Nitrates Directive consultation to 17th May. Input: 4000 characters plus optional document.

EU survey on Horizon Europe R&D Work Programme

European Commission DG Research is asking for feedback on expected impacts and outcomes for each of nearly 50 thematic and functional clusters etc. of the Horizon Europe 2025 Work Programme. Deadline for input: 6th May. The themes (called "Destinations") relevant to nutrient management, in Cluster 6 (Food, bioeconomy, natural resources, agriculture, environment): Destination 2 Fair, healthy and environment-friendly food systems from primary production to consumption, Destination 3 Circular economy and bioeconomy sectors, Destination 4 Clean environment and zero pollution. The Commission's proposals include for Destination 2 "Farmers are enabled with tools, innovations and practices to sustainably manage natural resources (in soil, water, nutrients, biodiversity)" and for Destination 4 "Farmers are empowered to make informed management decisions on water, carbon, nutrients and greenhouse gas balances for environmental and economic sustainability, preventing and reducing pollution from agriculture" and "Advanced water-nutrient-soil management tools that integrate multidimensional data from sampling, remote sensing and other data sources to enable context-specific decision making at farm level". For each Destination, there is a specific survey (you are invited to respond to more than one survey) with one or two tables to select priorities between proposed impacts and outcomes, plus possibility to submit short comments (300 – 1500 characters).

European Commission, Research and innovation, "Feedback opportunity for Horizon Europe work programme 2025", surveys online <u>HERE</u>. Open to 6th May 2024.



Policy

CEN seeking expert on fertilisers testing

CEN is looking for experts on analytical methods for fertilising products, for working groups developing standards to support the EU Fertilising Products Regulation (FPR), in particular an expert on analysis of organic carbon content. The European Commission has mandated CEN (Comité Européen de Normalisation, the European Committee for Standardization) to develop a significant number of new EU analytical method standards for the testing of different parameters in CMCs and PFCs of the FPR. Industry and expert participants are welcome for the relevant working groups. CEN is specifically also looking for a project leader to develop the method and organise inter-laboratory study for the standard "Inorganic fertilizers - Determination of the organic carbon content organic carbon". The expert will be supported by the relevant Working Group in TC 260, and budget is available for the compensation of costs.

Contact CEN Sophie. Dithmer @din.de

Summary of EU Fertilisers Expert Group 15-16 April 2024

Animal by-products (ABPs) in EU fertilising products:

Discussion of a draft Commission "Frequently Asked Questions" answer on the status of inclusion of ABPS in CE-mark fertilisers (under the FPR) concluded that at present, to ESPP's understanding:

- Certain animal by-products can already be included today in EU fertilising products, but only as follows (as specified in 2023/1605):
 - Most Cat2 and 3 ABPs (including raw manure, slurries, treated manures), can be used as <u>inputs</u> to composts or digestates (CMCs 3 and 5), as specified in these CMCs, but <u>only if</u> the composting / anaerobic digestion process achieves the ABP Regulation conditions (this does NOT include national 'alternative' temperature/time profiles). *In effect, this is Cat2-3 materials, inc. manure, where <u>the compost/digestion process achieves 'sterilisation'</u> as required by the ABP Regulations.*
 - Raw manure/insect frass (but <u>not</u> other Cat2-3 materials) can be used as an <u>input</u> material for biochars/pyrolysis/gasification materials (CMC14) but <u>only if</u> the processing conditions for "processed manure" specified in the ABP Regulation 142/2011 (temperature/time, installation inspection ...) are achieved in the pyrolysis/gasification process.
 - "Processed manure" (as defined in the ABP Regulations), or ABP-criteria compost or digestate of other Cat2-3 materials, can be used as <u>inputs</u> to CMC3 compost, CMC5 digestate or CMC14 pyrolysis, even if the compost/digestate process does not achieve the ABP Regulation conditions. *In effect, this is CMC3/5* compost/digestate where the input material has <u>been 'sterilised" (to ABP requirements) before</u> sending to the composter/digester..
 - Note: if ABPs (e.g. raw manure) are used as inputs for a compost/digestate process which achieves CMC3/5 criteria but does NOT achieve the ABP 'sterilisation' criteria (as specified in 2023/1605) then the output product (i.e. compost/digestate) cannot be 'post-sterilised' and then used in an EU fertilising product. This is because sterilisation is not a listed post-processing for compost/digestate under the FPR CMC3/5 (see consolidated version of the FPR)
 - Most Cat 2 and 3 ABPs (inc manure etc. as above) can be used as input to combustion processes as specified in CMC13 (ashes and derivates thereof)
- Will hopefully be included soon,
 - o "processed manure" in CMC10 (draft regulation here and annex here, adoption underway)
 - a limited list of other Cat2/3 materials in CMC10 (list in 2023/1605, study underway with QLab, see below, before hopefully preparation of an amendment to include these into CMC10).

All stakeholders with information concerning the ABPs listed in 2023/1605 (current use as fertiliser, e.g. under national regulations, processing, markets and potential, nutrient content and agronomic benefits, contaminants and safety) are invited to submit these to the QLab study via the questionnaire here (if possible before end April).

ABPs are excluded from the NMI study underway into possible new materials/processes for FPR CMCs (see below) and DG GROW indicated that other ABPs could not be discussed in the EU Fertilisers Expert Group until DG SANTE has validated an 'ABP End Point' (DG SANTE delegated regulation amending the ABP Regulations). ESPP therefore proposed, with other organisations, to take this forward outside the official EU Expert Group.

Stakeholders with knowledge of other ABPs, or of other ABP processing methods, relevant to use in fertiliser and which are not in 2023/1605 are invited to send information to info@phosphorusplatform.eu (nature of the material / process, uses in fertilising products).



NMI study on possible new input materials for EU fertilising products (possible new CMCs / new CMC processes).

This study (see <u>ESPP eNews n°85</u>) will take 1-2 years and could in some cases, lead to draft amendments to include new materials or CMC-processes into the FPR. However, the list of materials / processes to be studied will be defined in coming weeks. Input is invited from companies and stakeholders on secondary nutrient materials and processing methods not currently included in the EU FPR, as specified in the 'questionnaire' on page 28 of the <u>NMI study inception report</u>:

- Detailed description and specifications for the secondary material and for its processing to a fertilising product
- Legal status: is the material/process already applied for fertilisers in EU Member States or other countries?
- Market situation: current market size and key actors, EU market potential?
- Is the material or resulting fertilising product susceptible to cross-border trade (rather than domestic use)?
- Agronomic benefits
- Health or safety data or studies.

Input can concern any material / process listed in the NMI study inception report chapters 3-4-5-6 (pages 8-11)

Animal by-products and "derived products" (ABPs) are not included in the NMI study, but ESPP is collecting information on ABPs and ABP processing methods (not currently covered in 2023/1605) to prepare a concerted request to the European Commission to address currently "missing" ABPs – so information to ESPP is welcome.

ESPP is inputting to the NMI study with a table of possible new CMC input materials / processing methods. Draft is on www.phosphorusplatform.eu/regulatory (under EU Fertilising Products Regulation -> "ESPP list of possible new CMC materials & processes 21 4 24"). Any comments or additions to this table are welcome.

Please send comments and input to the NMI report and/or the ESPP table, by 13th May 2024, to info@phosphorusplatform.eu
CE certification process and conformity assessment

Giel Tettelaar, EFCI Register, presented proposals from the Notified Bodies Coordination Body, in particular to clarify and make more feasible certain requirements of the certification procedures, including distinguishing between periodicities for sampling and for audits, and not requiring certification visits to every site providing similar input materials (e.g. a number of sewage works providing recovered struvites from the same process). For reasons unclear, one Member State objected to the "assumption of conformity" currently applied by NOBOs, that is if there is no reason why a specific contaminant should be present in a material (not in inputs, not generated in processing), then it should not be necessary to test for it, as currently specified in the Commission's FPR Frequently Asked Questions document (Q 10.6). ESPP considers this as important to avoid unnecessary testing costs and as justified and pragmatic.

Clarifications via the Commission FAQ document

A number of new Q&As were validated for inclusion into the Commission's "Frequently Asked Questions" document, which effectively provides guidance on interpretation of the FPR. It is clarified that plant materials under CMC2 can be "waste" or "by-product". Clarification of the definition of "biowaste" (in CMCs 3 and 5) was agreed, noting the "comparable" waste streams are also included, such as food waste flows from factories for example producing sandwiches or ready-to-cook meals (e.g. offcuts, discarded food materials because of deterioration) but not sludges or specific processing flows from factories processing e.g. vegetables, dairy products, pet foods, biofuels ...

"Evaluation" of the EU Fertilising Products Regulation

The evaluation of the FPR will be launched by the European Commission in coming months, as required in art. 49 of the Regulation, with the aim of identifying if certain aspects of the Regulatory text should be modified (see <u>ESPP eNews n°84</u>). Art. 49 already indicates certain points which must be evaluated (contaminants including cadmium and uranium, functioning of the internal market, conformity assessment, market surveillance, optional harmonisation). The Commission is currently defining the terms of reference to commission a study to support this evaluation.

EU Fertilisers Expert Group documents (CIRCABC public) HERE.

Use of Category 1 Animal By-Product ash as fertiliser

ESPP has commissioned a risk analysis of use as fertiliser of combustion ash from "disposal" of Cat.1 ABPs. The European Commission DG SANTE has requested an Opinion on safety of such ash from EFSA (European Food Safety Agency). The analysis has been commissioned by ESPP to SAFOSO Switzerland, animal health expert consultants. Because there is to our understanding no proof that incineration eliminates prion infectivity (TSE / BSE "mad cow disease"), see ESPP eNews n°73, the SAFOSO risk analysis will be based on: number of BSE cows in Europe (very low), dilution of material in processing, risk reduction in processing, risk reduction in ash use as fertiliser. This will be supported by evidence that Cat.1 ash has been for decades and continues to be widely used as fertiliser in the UK (and elsewhere?) with no identified infection of animals or humans, and similarly for Cat.1 ash handling in landfills etc... We thank EFPRA for providing helpful input to this study.

If you have any information which could support this study (scientific report references, examples or data of Cat.1 ash use as fertiliser in other countries in the world, information on Cat.1 ash handling and storage in landfills, please contact info@phosphorusplatform.eu)



European Commission update on Cat.1 ABP ash, algae grown in manure

In reply to a letter from ESPP, DG SANTE confirms that an Opinion on Cat.1 ABP ash is requested from EFSA (to be completed by 2025) and indicates position on nutrients from ABP ash to animal feed, algae grown in manure. ESPP has launched a study to input to the EFSA Opinion on Cat.1 ash (see above). On possible use of nutrients recovered from ash in animal feed, DG SANTE considers that this should be considered after the EFSA opinion on Cat.1 ash use as fertiliser. On algae grown in manure, DG SANTE considers that there is no possibility for use of the algae nor of materials extracted from them in animal feed nor in fertilisers, but that algae grown in "processed manure" can be used in fertilisers (grown in manure which has been 'sterilised' as defined in the ABP regulations).

Letter from ESPP to DG SANTE 29th January 2024 and reply of 3rd April 2024 HERE.

EU regulation on animal by-products (ABPs) should be fundamentally reviewed

Sixteen organisations, including ESPP, have sent an open letter to the European Commission calling for a comprehensive review of EU regulation of ABPs to enable circularity whilst continuing to ensure safety. We underline our complete commitment to ensuring safety, and perception of safety by consumers and stakeholders, but suggest that current ABP regulation is fragmented and incoherent, with different value chains treated differently and incoherent vocabulary, leading to regulatory obstacles, excessive demands on administrative resources and consequent failure to address these. The letter calls on the Commission to include a review of ABP regulations in the next 2024-2029 work programme. A number of examples provided by stakeholders are presented in annex, including difficulty to use in animal feed amino acids which are recognised human food ingredients, failure to recognise in the EU Fertilising Products Regulation 'alternative' temperature-time profiles for composting and anaerobic digestion despite these being safely used in Member States, failure to recognise complete transformation of ABPs which eliminate risks (e.g. recovery of nutrients from ashes), absence of pathways to coherently assess new processing pathways or materials (e.g. algae grown in manure).

Open letter to the European Commission, 3rd April 2024.

Differences between Netherlands and EU fertilisers regulations

Report by Wageningen UR identifies over 60 secondary nutrient materials which are authorised for use in fertilisers in The Netherlands but not in the EU Fertilising Products Regulation (FPR). This includes:

- 11 wastes and by-products, such as food industry by-products not listed in FPR CMC6, by-products from biofuels production, paper industry by-products, pharmaceuticals by-products, demolition gypsum waste, ammonium phosphate from fire extinguisher refurbishment,
- 31 vegetable residues not included in FPR anaerobic digestion inputs, including vegetable oil and fat residues, food industry sludges and various food industry by-products which are not "bio-waste", biofuel and glycerine production residues,
- 24 animal by-products not included in FPR anaerobic digestion inputs.

The WUR report recommends to:

- ✓ Better define "bio-waste" and to define additional groups of food-industry, biofuel, dairy and animal feed industry by-products for inclusion as inputs to FPR digestates (CMC5),
- ✓ Define additional groups of food industry by-products for inclusion in CMC6 (use as such in fertilising products),
- Consider other temperature-time profiles for sanitisation of animal by-products in anaerobic digesters (CMC5)

'Kunnen de afval- en reststoffen uit de Uitvoeringsregeling Meststoffenwet beantwoorden aan de Europese Meststoffenverordening?" (Can the waste and residues from the Netherlands Fertilisers Act Implementation Regulations comply with the European Fertilizers Regulation?), in Dutch, 58 pages, 2-page summary in English, I. Regelink et al., Wageningen Environmental Research, report n°3317, ISSN 1566-7197, Jan. 2024 DOI.

ESPP is looking for advice / support on Al

ESPP is seeking help to use Artificial Intelligence (AI). We wish to contract advice and support to set up AI that can help us find new and important updates about phosphorus sustainability and nutrient recycling. Our goal is to use AI to better share information with our network. We might need help setting this up, training AI, or guiding a programmer to create an AI tool. Right now, we are overwhelmed with many alerts from the internet and scientific sources every week, even though we try to target our alert filters. We hope AI could read these alerts and other documents and pick out those which are most likely to be important to us, such as new ideas, big changes in technology or markets, new full-scale nutrient recycling plants or updates in regulations. We also want it to work in different languages, not just English. The main problem is to figure out what news is truly new and exciting, rather than just getting summaries of many research papers on topics we already know about. It's not certain if AI can really do this, but we might find out by trying.

If you would be interested in taking forward an initial feasibility analysis of AI for ESPP, contact info@phosphorusplatform.eu



Nutrient recycling

Benefits, perspectives and challenges of digestates

Comprehensive report by European Biogas Association (EBA) explains digestate production, properties and processing, benefits for climate and for soil health and details the regulatory framework at the EU and Member State levels. EBA estimates that by 2050 digestates in Europe will contain 9.7 Mt of nitrogen, 1.7 Mt of phosphorus and 0.8 Mt of potassium, that is around 90%, 60% and 25% respectively of nutrients currently in mineral fertilisers. Nutrient content and availability in digestates are explained, both rapidly available and long-term nutrients, depending on different input materials and digestate processing. Benefits for climate and soil health are discussed, including reductions in emissions from raw organic wastes, soil carbon sequestration, impacts on soil microbial activity, soil structure, water retention, nutrient retention, pH buffering. The EU regulatory framework is outlined, including waste, fertiliser, animal by-product regulations and the Nitrates Directive. National regulatory frameworks are specified for Member States, including waste status, fertiliser regulations, quality schemes and specific national regulations. The report concludes that the complexity of regulatory frameworks is an obstacle to digestate valorisation, in particular where digestate does not have fertiliser status under national fertiliser regulations. The Nitrates Directive restriction on application of digestates from manure is considered a key obstacle. Better information on the value of digestates as an organic fertiliser and soil improver is needed.

"Exploring digestate's contribution to healthy soils", European Biogas Association, March 2024, 40 pages LINK

Ostara struvite approved for EU Certified Organic Farming

Ostara's recovered struvite, from municipal wastewater, has been validated for EU Certified Organic Agriculture under the EU regulation $\underline{2021/1165}$ (ESPP eNews n°73). This follows the successful EU Fertilising Products Regulation of Ostara's Crystal Green Pearl® recovered struvite (CE-mark, see $\underline{\text{ESPP eNews n°82}}$), which is a prerequisite requirement for EU Organic Farming certification. The FiBL / SKAL validation obtained by Ostara also confirms that the Ostara recovered struvite complies with the criteria of The Netherlands Organic Farming input list. Ostara states: "Crystal Green Pearl is a granular fertilizer with an analysis of 5% Nitrogen (N), 28% Phosphorus Pentoxide (P_2O_5), and 16% Magnesium Oxide (MgO). This one-of-a-kind fertilizer source is produced with Ostara's nutrient recovery solutions that recover nutrients from wastewater and prevent excess, water soluble nutrients from entering global water systems. Crystal Green Pearl is minimally water-soluble, although it's 100% soluble in weak organic acids naturally exuded from plants. This maximizes nutrient availability ... highly efficient phosphate fertilizers to release nutrients in response to crop demand. Crystal Green fertilizers are proven to maximize yield, enhance soil health and significantly reduce phosphate tie-up, runoff and leaching, thereby improving food security while protecting the environment."

"Ostara Secures Certified Organic Registration of Recovered Nutrients for Crop Production", Ostara, 17th April 2024, <u>HERE</u>. FiBL organic validation for Ostara recovered struvite Crystal Green HERE.

N2 Applied and Felleskjøpet Agri cooperative to implement N-recycling

Plasma N-enrichment and N-recycling technology of N2 Applied (ESPP member) will be rolled out by one of Norway's main agricultural cooperatives, Felleskjøpet Agri. N2 Applied is also talking to the Bill & Melinda Gates Foundation. N2 Applied's plasma technology both fixes nitrogen from the atmosphere and stabilises nitrogen already present in manures or digestates, so enabling storage and efficient recycling to crops, whilst also reducing ammonia and methane emissions (see ESPP eNews n°84). Felleskjøpet Agri has over 50 000 cooperative members and an annual turnover of c. 15 billion €. A two-year letter of intent will roll out the plasma N2 Applied's technology to farmers as part of the cooperative's advice and services to farmers towards sustainability and balanced fertilisation and cost benefits, enabling them to better use their own manure as crop fertiliser with reduced environmental impacts.

"Felleskjøpet Agri and N2 Applied enters agreement", 19th March 2024, <u>HERE</u>.

Bill & Melinda Gates Foundation and International Fertilizer Association (IFA), Marrakech, Morocco, March 2024 <u>HERE</u>

Bill Gates video "Why I love fertilizer", 2018, <u>HERE</u>..

Research and innovation

Struvite can be used in powder fire extinguishers

Powder fire extinguishers widely use mono ammonium phosphate (MAP). Lab tests showed that milled struvite, coated with DOPO-VTS, performs better to extinguish fires than MAP or neat struvite and can be stored at up to 100°C. It is not specified whether the struvite used was recovered or synthetic. The struvite was ball-milled first with ethanol, then with hydrophobic fumed silica, to fine particle size (90% < 20 µm diameter). It was then coated with 3% w/w DOPO-VTS, a derivative



of the commercial phosphorus flame retardant DOPO (9,10-dihydro-9-oxa-10-phosphaphenanthrene-10-oxide), reacted 1:1 with vinyltrimethoxysilane. Fire extinguishing performance was tested using burning heptane basin tests. Heat absorption and fire temperature decrease were better with the coated ultrafine struvite, fire extinguishing time was shorter and powder consumption was lower, compared to than with MAP (similarly ground), and also compared to uncoated struvite. Also, the coated struvite maintained its fire extinguishing properties when heated to 100°C, so could be stored in varying temperatures.

"Preparation and fire extinguishing mechanism of novel fire extinguishing powder based on recyclable struvite", Z. Liang et al., Materials Today Communications 34 (2023) 105410, DOI.

PFAS removal in pyrolysis

Lab tests using PFAS-loaded sand show 97% removal from the sand at 400°C or higher but significant transfer of organofluoride compounds to the offgas. The tests used purified sea sand mixed with 24 different PFAS (per- and polyfluoroalkyl substances) at total 2000 ng PFAS/g sand (0.0002% DM), in a 25mm diameter 40 cm high lab pyroliser with residence time 2 hours (significantly higher than industrial pyrolysis units). Because PFAS may be broken down to non-analysed shorter-chain PFAS, both PFAS (27 PFAS chemicals) and total organofluorides were analysed in both the pyrolysed material and in the laboratory pyrolyser offgas (using an acetone trap). In the PFAS-sand, organic fluorine removal was only c. 40% at 300°C, rising to 97% at 400°C or higher. Removal of PFAS from the sand was 99% at 400°C and the 27 analysed PFAS were non-detectable at 500°C or higher. The analysed PFAS were detected in the offgas up to 500°C pyrolysis temperature (not at 600°C). However, around 50% of the total initial PFAS fluorine was found as organofluorides in the offgas at 400°, 500°C, 600°C and 700°C. Similar tests were carried out using dried granulated sewage sludge from Bohuslavice-Trutnov municipal sewage works, Czech Republic, again showing >96% removal of organofluorides at 400°C with significant detection in the offgas. Sludge biochar from a commercial sludge pyrolysis unit operating at this sewage works was tested and the analysed PFAS chemicals were not detectable. This unit operates at 600°C with a residence time of 10 minutes.

"Removal of per- and polyfluoroalkyl substances and organic fluorine from sewage sludge and sea sand by pyrolysis", M. Husek et al., Biochar (2024) 6:31 DOI.

Stay informed & ESPP members

SCOPE Newsletter: www.phosphorusplatform.eu/SCOPEnewsletter eNews newsletter: www.phosphorusplatform.eu/eNewshome If you do not already receive ESPP's SCOPE Newsletter and eNews (same emailing list), subscribe at www.phosphorusplatform.eu/subscribe LinkedIn: https://www.linkedin.com/company/phosphorusplatform

Slideshare presentations: https://www.slideshare.net/phosphorusplatform - Twitter: @phosphorusESPP

YouTube https://www.youtube.com/user/phosphorusplatform

