

Recommendation for an academia/industry partnership to engage in collaborative refinement of a bioremediation-assisted heavy metal sorbent

Recommendation to establish a match between an academic partner (material science) and a microbiome-analysis-specialised company

Keywords: Partnership guidance / consultations
Bioremediation, heavy metals, pollution, microbiology

Aims of this recommendation

The recommendation package aims to establish a match between an academic partner (material science) and a microbiome-analysis-specialised company, with the aim to i) improve efficiency of a pollutant-scavenging innovative sorbent (already developed by the academic partner), ii) support university/industry interaction, iii) pave the way towards development of a marketable product and iv) generate original knowledge in microbial / environmental research.

Target group of this recommendation package

- Small and medium sized enterprises (SMEs)
- Research and development (R&D) institutions

In the fields of material research, microbiology, genetics, ecology

Background to this recommendation package

The document recommends collaboration between two institutions. It aims to encourage cooperative development of a high-capacity and effective composite sorbent for

Quick read

- The recommendation package originates from a potential match discovered among Virtual Lab entries.
- It outlines complementary competences and potential synergies and encourages two institutions to engage in an ecoinnovative project on heavy metal bioremediation.
- These institutions are from academia (material science) and industry (high-throughput DNA sequencing).
- Science-based explanations and the benefits for the two partners to engage in the collaboration are outlined.

clearing heavy metal-contaminated water. The recommendation derives from our search among Ecolnn Virtual Lab entries for possible matches. Though both partners completed forms in the “offer” and not the “demand” category, their profiles show a promising overlap; evident from a microbiologist’s point of view. Audience for this report are Ecolnn partner consortium, the two institutions, but also any university or company working in the fields of material science and/or microbiology. Furthermore, the document shall rise interest among municipalities affected by heavy metal-pollution in lakes, ponds, etc.

Summary of party / parties

Partner1: Polymer Institute of the Slovak Academy of Sciences

(see also VL entry: <http://ecoinnovative.eu/powerful-composite-sorbent-for-the-removal-of-contaminants-from-water/>)

Partner2: www.geneton.sk

(see also VL entry: <http://ecoinnovative.eu/microbiome-analysis/>)

Optionally, Economica (Austria) can guide the partnership by providing microbiology-based input

Summary of eco-solutions/knowledge/technology

Ecoknowledge transfer between both partners, optionally assisted by a consulting third partner (Economica, Austria) is anticipated. Briefly, for partner 1 knowledge gain in microbiology and enhanced application potential of its original product (sorbent material) can be anticipated, whereas the main benefit for partner 2 will be expansion/exploration of its customer market. Furthermore, the suggested cross-disciplinary collaboration can boost knowledge gain in basic science. (see below for details)

Summary description

discuss the background of the problem, situation or opportunity that has led to this report

Partner 1 already developed a sorbent material for cleaning heavy metal-polluted water. In the recommended partnership there is the potential to make this sorbent more efficient and more flexible in its application, by employing a bioremediation-based strategy. Partner 2 has the knowhow and facilities to analyse qualitative and quantitative composition of microbial communities. A mutual benefit arises if partner1 “upgrades” its sorbent material with microbial consortia in order to facilitate pollutant uptake via a bioremediation-based strategy. (see below for details).

Needs and requirements:

Partner1: Polymer Institute of the Slovak Academy of Sciences

- o Scientific reputation (publications)
- o Increase visibility and facilitate market entry of its output from applied science

Partner2: www.geneton.sk

- o Expand customer market / Exploration of new fields of application
- o Establishment in the field of ecoinnovation

Both

- o Bridge basic and applied science; facilitate academia vs. industry interaction; generate profitable ecoinnovative products

Summary of status of knowledge transfer

Provide a background to the status of the knowledge transfer or the needs of the innovation.

A team member from Economica (Austria) with microbiology expertise pointed out the promising match between the two institutions to the Ecolnn partner consortium (Feb 2019), and the responsible partner contacted GENETON

About the Ecolnn Danube project

The objective of the Ecolnn Danube project is to increase the cooperation of innovation actors in the field of eco-innovations with special emphasis on development and application of eco-technologies in the Danube Region.

www.interreg-danube.eu/approved-projects/ecoinn-danube

accordingly. Interest provided, GENETON and the Slovak Institute of Science will be matched in order to establish a collaboration.

Options and scenarios

Discuss the options under consideration. Discuss the background associated with each option.

The anticipated collaboration can emerge as a “private” project between the two partners. Alternatively, a more open format would involve external consultation and interaction with additional scientists (e.g. from the Slovakian institute of Science, from environmental protection agencies). Economica offers input on demand. Should the precise match (i.e. between exactly these two partners) fail, the recommendation package might be adapted for a more general applicability.

In-depth details / explanations of recommendations

Bouhajja E, Agathos SN, George IF. 2016. Metagenomics: Probing pollutant fate in natural and engineered ecosystems. *Biotechnol Adv* 34(8): 1413-1426

Edwards SJ, Kjellerup BV. 2013. Applications of biofilms in bioremediation and biotransformation of persistent organic pollutants, pharmaceuticals/personal care products, and heavy metals. *Applied Microbiology and Biotechnology* 97(23): 9909-9921.

see also Annex below

Date of recommendation package

28 Feb 2019

Author

Economica. Institute for Economic Research

About Ecolnn Danube recommendation packages

Recommendations in the context of the Ecolnn Danube project are useful suggestions and proposals on how to bring eco-solutions into commercial value, particularly through forms of knowledge transfer.

Recommendation packages relate to specific eco-solutions, specific problems or specific areas within technology transfer.

Partnership guidance recommendations aim to aid successful interaction between 2 or more specific demand and supply side stakeholders.

Pitch recommendations aim to aid successful knowledge transfer and/or commercialisation for a type of stakeholder.

Events, consultations and interactions recommendations aim to aid successful eco-knowledge transfer by focusing on a given issue, area or topic related to knowledge transfer.

Annex: original file “Virtual Lab_Match proposition” sent to Ecolnn partners

Virtual Lab_Match proposition_03 Feb 2019

Suggestion for match (though both entries are from the category „offer“, their needs and competences show a promising overlap)

Author: Economica (A. Pitzschke; microbiologist/biochemist)

Partner1

Polymer Institute of the Slovak Academy of Sciences

Virtual Lab entry: <http://ecoinnovative.eu/powerful-composite-sorbent-for-the-removal-of-contaminants-from-water/>

Partner2

www.geneton.sk

Virtual Lab entry: <http://ecoinnovative.eu/microbiome-analysis/>

Possible cooperation and benefit

Partner1 has developed a cellulose-based composite material for removing heavy metal contaminants from water.

Partner2 offers a sequencing service for microbiome analysis

(explanation: large-scale DNA-sequencing and subsequent identification of bacterial species in a highly complex sample).

Background

The potential of certain bacteria to “detoxify” polluted environments (soil, water) is well-known. Some species can accumulate certain heavy metals, thus offering a “biological tool” for remediation purposes. Most of these desired species originate from analyses of respectively polluted areas (mostly China; old mining areas etc.). Whereas “normal/non-polluted” environmental samples from soil and water contain a wide variety of microorganisms, contaminant-rich environments only enable survival of few well-adapted species.

Collaboration

Partner1 is advised to collaborate with partner2 in a project that potentially leads to discovery and characterization of new bacterial species suitable for remediation of polluted areas. Benefit for basic science can also be expected.

Reasoning

Depending on pollutant exposure, nutrient availability and external factors (temperature, humidity etc.) naturally occurring microbial communities undergo substantial changes in their qualitative and quantitative composition. A selection process occurs in which those strains that are best adapted to a given environment will become more dominant. Partner 2 has the competence/facilities to analyse microbiome composition in samples. Partner1 has the material to be analysed. A collaboration is suggested in which partner1 provides test material (collected e.g. from cellulose devices floating on heavy metal-contaminated water; weekly collection) for subsequent microbiome analysis. With regular sample collection a progressive

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change in microbiome composition is expected (=publishable data). Long-term exposure, i.e. longer selection process, is expected to progressively enrich for cellulose-attached bacteria that have high resistance to heavy metals and that – ideally- have the ability to accumulate heavy metals.

In other/simple words, the innovative composite sorbent undergoes a natural-selection-based shaping whose outcome is an enhanced functional capacity. Thinking one step further, such “inhabited” composite materials could then be used in contaminant-remediation applications, speeding up the remediation process.

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