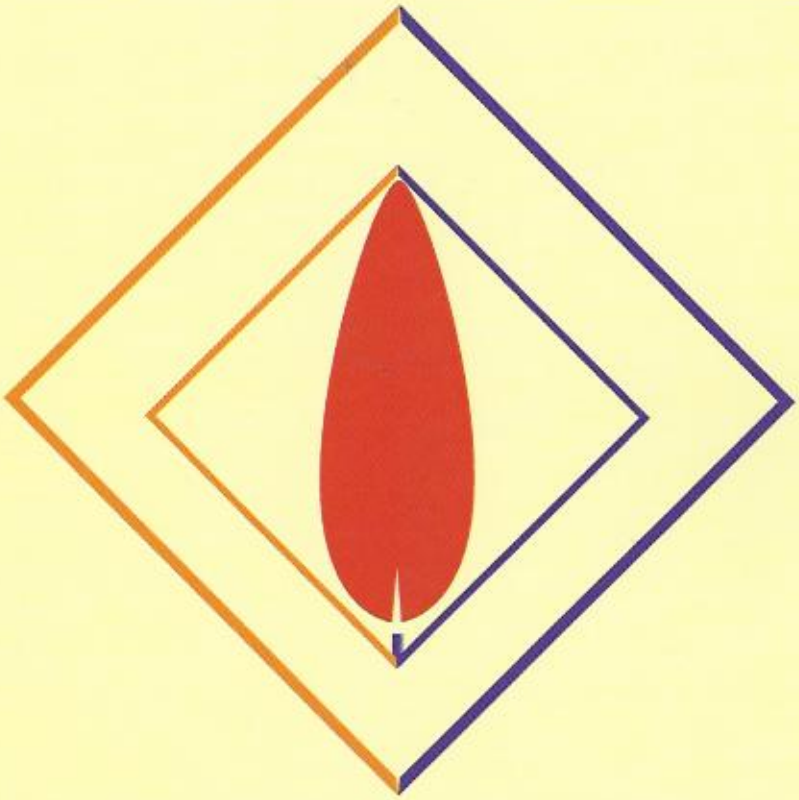
SILESIAN UNIVERSITY OF TECHNOLOGY
Institute of Thermal Technology
Gliwice, POLAND

POLISH ACADEMY OF SCIENCES
Combustion Section of the
Thermodynamics and Combustion Committee

POLISH SECTION OF THE COMBUSTION INSTITUTE



# BOOK OF ABSTRACTS

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# PHYTOREMEDIATION DRIVEN ENERGY CROPS PRODUCTION ON HEAVY METAL DEGRADED AREAS AS LOCAL ENERGY CARRIER. AN INTRODUCTION TO THE PHYTO2ENERGY PROJECT

**I. Ratman-Kłosińska [1], M. Pogrzeba[1], J. Krzyżak[1], G. Płaza[1], A. Hebner[2], B. Cania[3], Sz. Powałowski [3], M. Schloter[4], S. Werle[5], D. Burnete[6], A. Milandru[6]**

[1]Institute for Ecology of Industrial Areas
ul. Kossutha 6, 40-844 Katowice, Poland
e-mail: rat@ietu.katowice.pl

[2]Vita 34 AG Business Unit BioPlanta
Deutscher Platz 5a, D-04103 Leipzig, Germany
e-mail: Anja.Hebner@VIT34.de

[3] ProBiotics Polska,
Bratuszyn 21, 62-720 Brudzew, Poland
e-mail:barbara.cania@probiotics.pl

[4] Helmholtz Zentrum München Deutsches Forschungszentrum für Gesundheit und Umwelt (GmbH),
Ingolstädter Landstraße 1D-85764 Neuherberg, Germany
e-mail: schloter@helmholtz-muenchen.de

[5]Institute of Thermal Technology, Silesian University of Technology
ul. Konarskiego 22, 44-100 Gliwice, Poland
e-mail:sebastian.werle@polsl.pl

[6]Institutul de Studii si Proiectari Energetice
sa1-3 Lacul Tei Boulevard, 020371, Bucharest, Romania
e-mail: daniela.burnete@ispe.ro

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## ABSTRACT

The Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources sets up a 20 % target for the overall share of energy from renewable sources by 2020. In that context biomass as a source of energy has been gaining an increasingly strong interest mainly due to its renewability. In consequence energy crops become a serious competitor to food crops production on arable land. This is against the EU policy as the mentioned directive indicates that when favouring the development of the market for renewable energy sources, it is necessary to take into account the positive impact on regional and local development opportunities. At the same time it has been estimated that there are about 800 thousand $km^2$ of contaminated or potentially contaminated sites across Europe. One fourth of them is polluted with heavy metals. Due to pollution or lack of economically viable management

options, this land is often abandoned. A proper management of these sites consisting in using them for energy crops production combined with their phytoremediation could become an alternative matching environmental priorities with regional and local development opportunities. Especially, that some species typically used as energy crops as miscanthus *(Miscanthus* x *giganteus),* virginia mallow *(Sida hermaphrodita)*, cordgrass *(Spartina pectinata),* and switchgrass *(Panicum virgatum)* demonstrate promising heavy metal absorption capacities. This property is further explored under the Phyto2Energy project. This four- year effort aims to develop and validate in field conditions an innovative, complex approach combining phytoremediation of heavy metal contaminated sites with energy crops production and their conversion into energy using gasification. Field trials are carried out in parallel at experimental plots in Poland and Germany to identify these species among the pre-selected energy crops which deliver the best results taking into account two objectives: the biomass yield and the site specific environmental restoration goal. For the Polish site this goal is to remove heavy metals from arable land so that it could be potentially restored for food crops production while for the German site the objective is to demonstrate an economic use of a post industrial site while eliminating environmental risks posed by the heavy metals present in soil mainly to groundwater.
To facilitate the phytoremediation effect and achieve a satisfactory biomass yield, microbiological studies are ongoing to explain the role of endophytes in promoting biomass growth which will provide knowledge necessary to elaborate a new inoculum dedicated to promote the growth of biomass on polluted soils and thus facilitate the phytoremediation effect and increase plants' resistance to diseases caused by pathogens occurring at heavy metal contaminated sites.
For the tested approach, gasification process has been proposed as a solution enabling an environmentally safe convertion of the biomass produced by the four preselected plant species into energy taking account of its heavy metal contamination. For that purpose a set of parameters has been developed to valorize the heavy metal contaminated biomass from the viewpoint of the gasification installation characteristics and its technical as well as environmental performance. The impact of biofuel parameters on the quality and composition of the produced gas as well as other end products of the gasification has been studied. In particular the following has been analysed: the behavior of heavy metals during the gasification process; the effect of the mineral components contained in the biomass due to the applied agritechnical measures on the gasification process and installation; and the parameters of the produced ash from the viewpoint of its field application as fertilizer. Based on these studies guidance will be elaborated on how to optimize process parameters in order to gasify heavy metal contaminated biomass in a way safe for the environment and the installation.

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