

PLAS • CARB

INNOVATIVE PLASMA BASED TRANSFORMATION
OF FOOD WASTE INTO HIGH VALUE GRAPHITIC
CARBON AND RENEWABLE HYDROGEN

D 10.7 ARTICLES FOR PUBLICATION



This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement No 603488

Project deliverable

Project Number	Project Acronym	Project Title
603488	PlasCarb	"Innovative plasma based transformation of food waste into high value graphitic carbon and renewable hydrogen"

Instrument:	Thematic Priority
Collaborative project	ENV

Title
D10.7 Articles for Publication

Contractual Delivery Date:	Actual Delivery Date:
November, 30th 2016	November, 30 th 2016

Start date of project:	Duration:
December, 1st 2013	36 months

Organisation name of lead contractor for this deliverable:	Document version:
GEO	



Dissemination level (Project co-funded by the European Commission within the Seventh Framework Programme)

PU	Public	X
PP	Restricted to other programme participants (including the Commission)	
RE	Restricted to a group defined by the consortium (including the Commission)	
CO	Confidential, only for members of the consortium (including the Commission)	

Abstract:

This deliverable provides a list of all project disclosures which were submitted within the project duration for further dissemination. The project put forward a total of 27 disclosures (scientific publications, general interest articles, presentations and press releases) with the help of all project partners.



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1 INTRODUCTION

This deliverable provides a list of all project disclosures which were submitted within the project duration for further dissemination. The format of those disclosures varies according to the purpose of the work and the target group to be reached:

- Presentations at events to transfer specific knowledge/results generated within PlasCarb
- General interest articles submitted to dissemination channels for wide outreach
- Press releases to specific target groups with a specified message
- Scientific publications and reports with either gold open access in high-profile magazines or with green open access self-archived and disseminated.

The list is presented in chronological order over the 36 month of the PlasCarb project.

It was anticipated at the beginning of the project that more the 10 disclosures of the above named format would be brought forth in the project duration. This deliverable presents 27 of such disclosures showing the great joint dissemination efforts of all PlasCarb consortium partners to make the project and separate work contribution by partners more visible.



2 DISCLOSURES FOR PUBLICATION

2.1 6 February 2014 – FhG IBP

Colleagues of the Institute for Building Physics of the Fraunhofer Gesellschaft (FhG IBP) held a presentation at the DRAGON Project Life Cycle Assessment Workshop in Loeben (Austria) about the PlasCarb project in general and the LCA-aspects of the PlasCarb technology in specific. This LCA Workshop is part of the so called "Clustering Activities" of FP7 projects dedicated to the topic "Resource Efficiency"

Presentation available at: http://www.dragonproject.eu/_pdf/5301e3a75f192.pdf


PlasCarb



Innovative plasma based transformation of food waste into high valuable graphitic carbon and renewable hydrogen

Fraunhofer Institute for Building Physics (IBP)

M.Sc. Peter Brandstetter

build on knowledge



Life Cycle Engineering  



2.2 25 March 2014 - GEO

A general interest article was published by Krisztina Tóth from Geonardo Ltd. (GEO) to introduce the PlasCarb project and to focus the attention of readers to the worldwide problem of food waste and how PlasCarb can approach this problem with an innovative waste management technology. The PlasCarb project was put into the perspective of the “European year against food waste” 2014 and it has been shown what the contribution of PlasCarb to Europe’s economy can be.

The [article](#) appeared on the blog of Europa Media, a sister company of Geonardo Ltd.



TURNING FOOD WASTE INTO RESOURCE?

– EU actions and forward thinking projects. Welcome PlasCarb!

Food waste is food loss occurring during the retail and final consumption stages due to the behaviour of retailers and consumers – that is, the throwing away of food.¹ This definition describes well what “food waste” means in legal terms, but who knows what it means in numbers. Did you know that almost 90 million tonnes of food waste is generated annually in the EU, which is 180kg/person/year, and about 126 million tonnes a year is expected by 2020 unless actions will be taken?²

Krisztina Tóth
25 March 2014


f G+ in 




2.3 30 March 2014 – CRPP CNRS

A poster was presented by Katerina Kampioti from the Research Centre Paul Pascal at the National Centre for Scientific Research – (CNRS CRPP) at the ChemOnTubes 2014 conference in Riva del Garda, Italy. It illustrated research findings on the quality of the graphitic nanopowder (Renewable PlasCarbon, RPC) obtained through the PlasCarb process.

More information at: <http://chemontubes2014.crpp-bordeaux.cnrs.fr/>



Innovative plasma based transformation of food waste into high value graphitic carbon and renewable hydrogen




CENTRE DE RECHERCHE PAUL PASCAL

HIGH VALUE FORMS OF CARBON FROM FOOD WASTE

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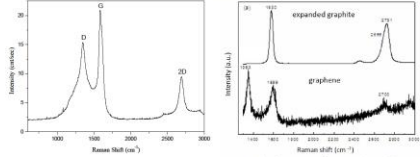


INTRODUCTION

The European Parliament considers that food waste is wasteful of resources. However, food waste can be transformed into high value graphitic carbon and renewable hydrogen through energy efficient transformation of methane resulting from decomposition of food waste. In this poster we report the Raman and TGA characterization of the graphitic nanopowder.

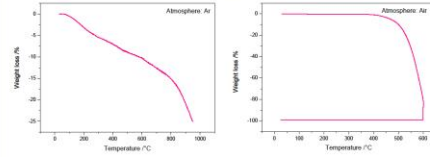
CHARACTERIZATION OF GRAPHITIC NANOPOWDER

RAMAN

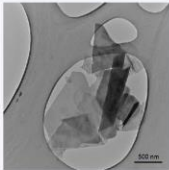


Results of Cristina Vallés on graphene ribbons

TGA



TEM



PERSPECTIVES

- More characterization techniques will be performed using XPS, AFM, SLS, DLS, UV/Vis absorbance...
- We will report on the most appropriate purification process of graphitic carbon resulting from food waste processing, based on the varied procedures that the CRPP laboratory has developed over the years. The particular technique that will be used is treatment by reductive dissolution, a process developed and patented by CRPP. An alternative procedure that will also be implemented is that of dispersing the nanocarbons by themselves in organic solvents or with surfactants in water, with the help of sonication.

CONCLUSION

- Raman and TEM techniques show the presence of carbon with graphenic character.
- TGA experiment in Ar atmosphere shows the possibility of the adsorption on the surface of the nanoparticles of hydrocarbon species. TGA experiment in air atmosphere indicates the presence of 1% of impurities.

REFERENCE


Cristina Vallés, Carlos Drummond, Hassan Saadaoui, Cláudia A. Furtado, Maoshuai He, Olivier Roubeau, Luca Ortolani, Marc Monthieux and Alain Pénicaud, J. AM. CHEM. SOC. 2008, 130, 15802–15804

ABOUT PLASCARB PROJECT


PlasCarb is a 3-year long collaborative project started on 1st of December 2013 and co-funded under the European Union's Seventh Framework Programme (FP7). The PlasCarb project aims to transform food waste into a sustainable source of significant economic added value, namely graphitic carbon and renewable hydrogen.

FOOD WASTE TRANSFORMATION


An EU report from 2010 estimated that food waste in the EU27 was 89 million tonnes per year (equivalent to 179 kg per person) rising to 126 million tonnes per annum by 2020, this waste would generate 170 million tonnes of CO₂ per annum, equivalent to 3% of all EU27 Green House Gas (GHG) emissions. Food waste itself is a difficult waste fraction to manage as it is wet and putrescible and becomes odorous, is a wasteful resource and ultimately a health hazard. The PlasCarb project will convert food waste into biogas a mixture of methane (CH₄), Carbon Dioxide (CO₂) and impurities using Anaerobic Digestion (AD) technology. The biogas from the food waste will be monitored over a period of 12 months in order to assess the volumes of biogas produced, the amounts of methane, carbon dioxide and impurities produced based on seasonal variations. Also a process will be assessed for the economical viability for the removal of trace impurities from the biogas.



Food waste transformation



Microwave plasma




Graphitic Carbon and renewable Hydrogen


CONTACT

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PARTNERSHIP




Centre for Process Innovation Limited
— CPI




GasPlus
2000 Limited




National Centre for Scientific Research
— CNRS




Institute for Building Physics - IBP
— Fraunhofer




Uvasol Ltd.




GAP Waste Management



Geonardo Ltd.



Abalonyx



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2.4 08 April 2014 – CNRS CRPP

The presentation by Alain Pénicaud from CNRS CRPP at the Cargèse International School on Graphene & Co. in Cargèse, Corsica introduced RPC as a basis for carbon nanotubes and graphene.

More information available at: <http://www.graphene-nanotubes.org/fr/graphene-school-2014.html>

The slide features the following content:


- Logos:** CNRS (www.cnrs.fr) and Université de BORDEAUX.
- Title:** Liquid Formulations of Carbon Nanotubes & Graphene
- Author:** Alain Pénicaud
- Contact:** Centre de Recherche Paul Pascal, CNRS, Université Bordeaux-I, penicaud@crpp-bordeaux.cnrs.fr
- Logos:** CRPP and GDRI Graphene Nanotubes.
- Footer:** Alain Pénicaud, Centre de Recherche Paul Pascal - CNRS - Université de Bordeaux | Graphene & Co. International School, Cargese, April 8-18, 2014



2.5 15 October 2015 - CPI

A presentation was help by Neville Slack from the Centre for Process Innovation Ltd. (CPI), project coordinator of PlasCarb, at the conference on Research and Innovation for a Circular Economy in European Regions in Brussels, Belgium. The official PlasCarb project poster was presented to introduce and explain the technology value chain behind the PlasCarb project .

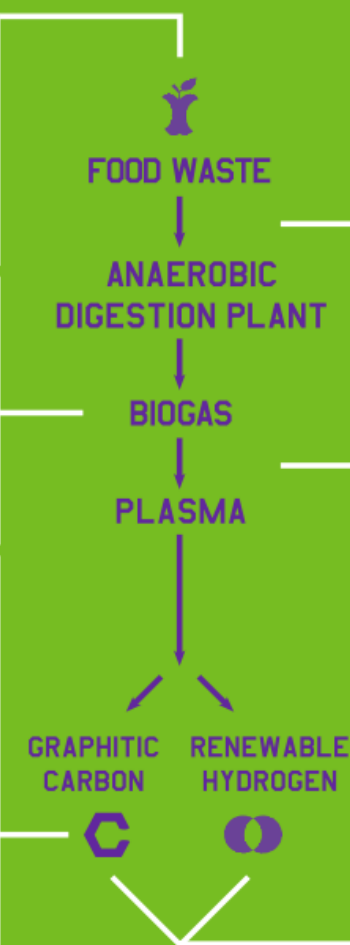
More information at: <http://ec.europa.eu/research/index.cfm?pg=events&eventcode=55246BA9-B53D-1B09-C2C037287C796673>



Innovative plasma based transformation of food waste into high value graphitic carbon and renewable hydrogen.

PlasCarb is a 3-year collaborative project which started on 1st December 2013 and co-funded under the European Union's Seventh Framework Programme (FP7). The project will transform biogas generated by Anaerobic Digestion of food waste using an innovative low energy microwave plasma process to split biogas (methane and carbon dioxide) into high value graphitic carbon and renewable hydrogen.

The PlasCarb consortium is composed of eight partners from five European countries, whose complimentary expertise will enable the required results to be successfully delivered. The project is coordinated by Centre for Process Innovation Limited (UK) and includes: GasPlas AS (NO); CNRS (FR); Fraunhofer IBP (DE); Uvasol Ltd. (UK); GAP Waste Management (UK); Geonardo Ltd. (HU); Abalonyx AS (NO).



FOOD WASTE

An EU report from 2010 estimated that food waste in the EU27 was 85 million tonnes per year rising to 126 million tonnes per year by 2020. This waste would generate 170 million tonnes of CO₂ per year, equivalent to 3% of all EU27 Green House Gas (GHG) emissions. PlasCarb is aiming to transform food waste into high value graphitic carbon and renewable hydrogen.

BIOGAS GENERATION

The biogas plant feedstock arrives from restaurant and industrial food waste collections. Inside an enclosed reception hall, the materials are de-packaged and the organic portion (98% by weight) is then fed into an intermediate holding tank before being pumped to the 2-stage fermenters for anaerobic fermentation. After the digestion process the remaining material is pasteurized and stored in a separate holding tank prior to utilization in local agriculture. The facility has been designed to meet the PAS110 standard for digestate.

PROCESS ENGINEERING

The aim of the separation and purification processes is to increase the value of the outputs. PlasCarb will research and investigate a range of GAS/GAS and GAS/SOLID SEPARATION techniques to determine the most cost effective methodologies, and define the optimal process to separate the combined Carbon species and then the renewable hydrogen (RH₂) from any other gases.

PLASMA PROCESS

GasPlas has developed and protected a process involving energy-efficient microwave-induced plasma cleavage of CH₄ into H₂ and graphitic carbon, with no CO₂ emissions. This process uses a non-equilibrium plasma induced by microwave energy, in which the microwaves provide a unique means of efficiently transferring energy directly into the bonds in the CH₄ molecules.

BIOGAS ANALYSIS

CH₄, CO₂, Impurities (H₂S, NH₃, etc.)

MARKET APPRAISAL

The output products of the PlasCarb process have significant market potential. Graphite is one of EU's 14 economically critical raw materials imported in substantial quantity (up to 95%) into the European Union. Graphite market consists of synthetic graphite, carbon fibre and natural graphite with a total global market of nearly 10 billion EUR.

The market application opportunities for:

- Graphitic carbon: Li-ion batteries
- High surface carbon with high proportion of graphene: supercapacitors; conductive coatings; printed electronics

Hydrogen is used in significant quantities by industry. Predictable global demand in 2016 is 286 million m³ worth 35 billion EUR. Hydrogen uses range from ammonia production, chemical industries and refining, electronics, metal and glass industries. Hydrogen has been also identified as a future transport fuel.








CARBON FORMATION

This figure illustrates the dispersion of the carbon form in water using surfactant and after tip sonication treatment. Optical microscopy, transmission electron microscopy (TEM) as well as static light scattering (SLS) are presented to characterize the dispersions. Optical microscopy shows the absence of aggregates, TEM shows the presence of graphene petals. Static light scattering shows the presence of two size populations. After centrifugation the isolation of the smallest size population is achieved.

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PARTNERSHIP

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2.6 17 October 2014 – CNRS CRPP


Katerina Kampioti from CNRS CRPP presentation a poster at the CarboRaman School, a thematic CNRS school dedicated to the study by Raman spectroscopy of carbonaceous material in all its forms. It took place from 12th to 17th of October at the Domaine de Chalès, Orléans, France.

The aim of CarboRaman was to promote exchanges and interdisciplinary approach of Raman spectroscopy and carbonaceous materials. The training was intended for researchers, engineers and PhD students from various fields (spectroscopists, chemists, physicists, geologists, etc.) wanting to learn the Raman methods, learn about carbon materials and expand their research to new areas. The poster was focused on the valorisation of food waste through PlasCarb to high value forms of carbon. Scientific approaches for the investigation of the carbon forms were introduced and conclusion for further developments were given.

More information: <http://www.carboraman.cnrs-orleans.fr/index.php>




PLASCARB
Innovative plasma based transformation of food waste into high value graphitic carbon and renewable hydrogen



Centre de Recherche Paul Pascal

HIGH VALUE FORMS OF CARBON FROM FOOD WASTE

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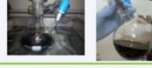
INTRODUCTION

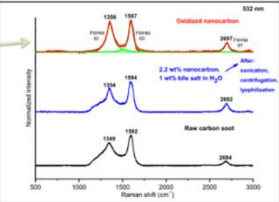
The European Parliament considers that food waste is wasteful of resources. However, food waste can be transformed into high value graphitic carbon and renewable hydrogen through energy efficient transformation of methane resulting from decomposition of food waste. In this poster we report the Raman and TGA characterization of the graphitic nanopowder.

RAMAN SPECTROSCOPY OF GRAPHITIC NANOPOWDER


Dispersions: After oxidative treatment

Bath sonication (2h) using acidic mixture (HNO₃ / H₂SO₄ - 1:3) at room temperature



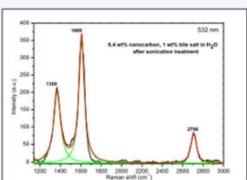


Dispersions: Using surfactants in water



Carbon treatment in H₂O, Surfactant, Tip Sonication, Dispersion

Characterization Techniques: Optical microscope, TEM, XPS, SLS



PERSPECTIVES

- More characterization techniques will be performed using XPS, AFM, SLS, DLS, UV/Vis absorbance.
- We will report on the most appropriate purification process of graphitic carbon resulting from food waste processing, based on the varied procedures that the CRPP laboratory has developed over the years. A procedure that is implemented is that of dispersing the nanocarbons after oxidative treatment or with surfactants in water, with the help of sonication. Another technique that will be used is treatment by reductive dissolution, a process developed and patented by CRPP.

CONCLUSION

- Raman and TEM techniques show the presence of carbon with graphenic character.
- The Raman spectrum of the oxidized nanocarbon shows a better defined D band which indicates purification of the soot and the decrease of some carbonaceous species (polyaromatics?). Moreover, the increase of the intensity of the D band indicates functionalization of the soot during the acidic treatment.

ABOUT PLASCARB PROJECT

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FOOD WASTE TRANSFORMATION

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MICROWAVE PLASMA


Molecular cleavage using plasma is well known. This microwave plasma technology involves microwave induced plasma to energy efficiently cleave CH₄ into graphitic carbon and hydrogen, with no CO₂ emissions. The process uses non-equilibrium (or 'cold') plasma induced by microwave energy from magnetrons. Microwaves provide a unique means of efficiently transferring energy directly into the electron bonds in gas molecules. In this non-equilibrium plasma, ionisation and chemical processes are directly determined by electron temperatures, and therefore not as sensitive to thermal processes and the gas ion temperature as thermal plasma. This enables increased energy efficiency, milder process conditions and reduced process complexity. The key element of innovation is the generation of large homogeneous non-equilibrium plasma zones for cracking methane into valuable carbon products at atmospheric pressure with potential for industrial scale operation.



Food waste transformation



Microwave plasma



Graphitic Carbon and renewable Hydrogen

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PARTNERSHIP



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2.7 07 November 2014 – FhG IBP


A presentation of PlasCarb and its LCA specifics was held by the colleagues of FhG IBP at the international congress and conference on “Advances in Food Processing: Challenges for the Future” in Campinas, São Paulo, Brazil. It was organized by Elsevier and coordinated of the Brazilian Institute of Food Technology ITAL and the Fraunhofer Institute for Process Engineering and Packaging (FhG IVV).

PlasCarb - sustainable transformation of food waste into graphitic carbon and renewable hydrogen via a plasma process

C.P. Brandstetter¹, J. Gantner², K. Grönman³, F. Gehring¹, 1 Fraunhofer-Institute for Building Physics, Germany, 2 University of Stuttgart, Germany, 3 Lappeenranta University of Technology, Finland

PlasCarb


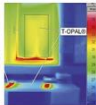


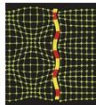



Fraunhofer Institute for Building Physics (IBP)




This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration.

December 2013 – November 2016


build on knowledge











Life Cycle Engineering



25 JAHRE
1989 - 2014
 Ganzheitliche Bilanzierung (GaBi)





Fraunhofer
 IBP



This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement No 603488

2.8 19 November 2014 – CNRS CRPP


The following poster presentation has been presented at the 5th Meeting of INCT Carbon Nanomaterials at the Federal University of Minas Gerais, Belo Horizonte, Brazil. Katerina Kampioti from CNRS CRPP presented the research findings of her research team in PlasCarb and specifically on RPC.



PLASCARB
Innovative plasma based transformation of food waste into high value graphitic carbon and renewable hydrogen

“HIGH VALUE FORMS OF NANOCARBON FROM FOOD WASTE”

Katerina (Aikaterini) Kampioti, Christèle Jaillet-Bartholome, Alain Derré, Carolina Ferreira de Matos, Aldo José Gorgatti Zarbin, Alain Pénicaud
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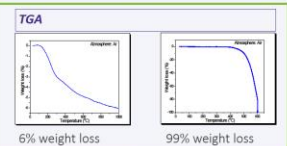
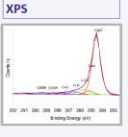
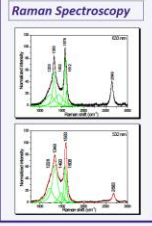
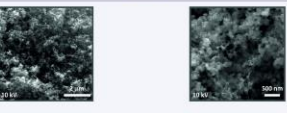


INTRODUCTION

The European Parliament considers that food waste is wasteful of resources. However, food waste can be transformed into high value graphitic carbon and renewable hydrogen through energy efficient transformation of methane resulting from decomposition of food waste. In this poster we report the

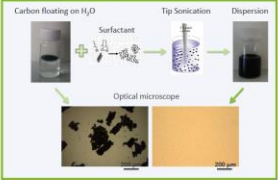
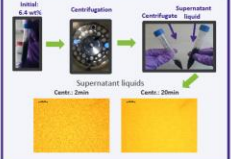
characterization of the pristine *green* nanocarbon, the dispersions of the nanocarbon and preliminary experiments on nanocomposites of the dispersion of nanocarbon with natural rubber as a new promising application.

Analysis of the pristine *green* nanocarbon

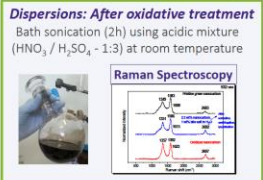





Dispersions of the *green* nanocarbon

Dispersions: Using surfactants in water

Dispersions: After oxidative treatment



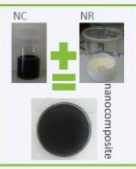
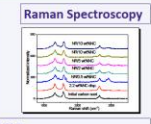
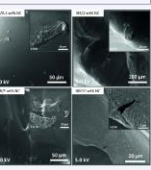
CONCLUSION

- The characterization techniques of the **pristine *green* nanocarbon** show a **carbon sp² network graphitic character** with a small amount of oxygen as well as carbon sp³.
- The nanocarbon is dispersible in H₂O with surfactant or after oxidative treatment.
- We obtained **well defined high concentrated dispersions** with one or two size populations.
- The preliminary tests of the **natural rubber/nanocarbon nanocomposites**, show homogeneous nanocomposites which keep the characteristics from both the natural rubber and the nanocarbon.

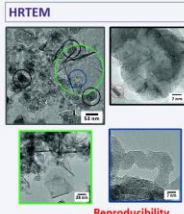
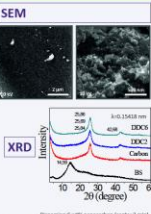
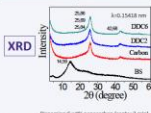
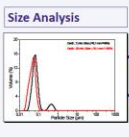
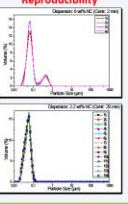
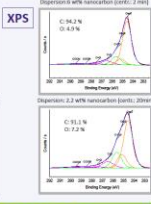
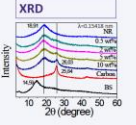
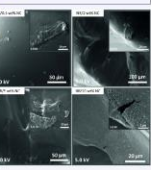
PERSPECTIVES

- Optimization of the oxidative treatment.
- More characterization techniques to the natural rubber/nanocarbon and evaluation of their properties.
- New applications of the dispersions of the nanocarbon and the oxidized nanocarbon.

Natural rubber/nanocarbon nanocomposites






Characterization and Reproducibility

MORE INFORMATION [www.plascarb.fr](#)

PARTNERSHIP



This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement No 603488



2.9 13 January 2015 - CPI

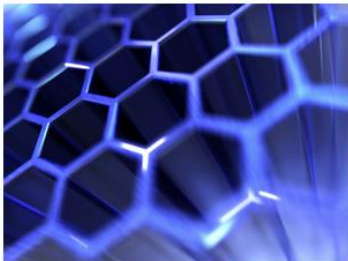
A press release by CPI was published about the PlasCarb technology and how the project works to transform food waste into graphene and renewable hydrogen.

It can be read under: <https://www.uk-cpi.com/news/cpi-work-transform-food-waste-graphene-renewable-hydrogen/>

CPI work to transform food waste into Graphene and renewable hydrogen

The Centre for Process Innovation (CPI) is leading a European collaborative project that aims to transform food waste into a sustainable source of significant economic added value, namely graphene and renewable hydrogen.

The project titled 'PlasCarb' will transform biogas generated by the anaerobic digestion of food waste using an innovative low energy microwave plasma process to split biogas (methane and carbon dioxide) into high value graphitic carbon and renewable hydrogen.





2.10 16 February 2015 – CPI

The Guardian published an article of the PlasCarb project sourced by an Interview with Neville Slack, PlasCarb's project coordinator. The article is available under the following link:

https://www.theguardian.com/sustainable-business/2015/feb/16/graphene-food-waste-circular-economy?CMP=share_btn_tw

Turning our mountains of food waste into graphene

Scientists are trialling out new techniques for converting food waste into
graphene and hydrogen



2.11 9 March 2015 – FhG IBP

This article published by FhG IBP highlights how PlasCarb can take on a function to repurpose obsolete food waste. Read more under:

https://www.ibp.fraunhofer.de/en/Press/Research_in_focus/Archives/April_2015_Food_waste.html

Food waste can be more than just garbage

It happens to everybody at some time: you lose track of a yoghurt hidden away at the back of your fridge, mold starts to grow on a loaf of bread in your cupboard, and somehow you wind up cooking too much food again. According to information from the United Nations' Food and Agriculture Organization (FAO), a third of all food produced worldwide ends up in the garbage. In a study for Germany, the University of Stuttgart found that every year domestic homes throw away just under seven million metric tons of food – primarily fruit and vegetables, but also baked goods, leftovers from meals, and dairy products. This waste of food also has a highly detrimental impact on the environment. For example, you need around 1,000 liters of water to produce a kilogram of bread, while it takes around 5,000 liters to make the same amount of cheese. And that is not to mention the energy consumed by food processing companies or the emissions generated during production. Last year, for instance, the FAO revealed that three billion metric tons of environmentally harmful gases are emitted every year as a consequence of food waste. These are figures that are prompting not only consumers but also industry and research to think again. An established technology for processing unavoidable food waste is to use it in biogas plants for generating energy. But that is only one possibility ...



2.12 17 April 2015 - CPI

The following interview with Neville Slack, project coordinator, and article published in the CO exist online magazine promotes the PlasCarb technology and the products that can be produced.

It can be read under: <https://www.fastcoexist.com/3045025/this-tech-can-turn-food-waste-into-graphene-power-and-fuel>

This Tech Can Turn Food Waste Into Graphene, Power, And Fuel

Graphite, a product of graphene, is a critical raw material that's 100 times stronger than steel



[Photos: Annette Shaff via Shutterstock]



2.13 26 June 2015 – CPI/GEO

Neville Slack gave an introductory presentation about PlasCarb at the EXPO Milan under the title: "Sustainable Solutions for Energy, Climate & Food security", in Milan, Italy.

The blog post on the Europa Media Blog gives a brief overview of the event: <https://www.eutrainingsite.com/blog/post/140> featuring also a video with Neville Slack presenting the project's scope and objectives.



http://www.plascarb.eu/news_and_events/plascarb/news/59



2.14 10 October 2015 - CPI

An article has been published by DG Environment on the Horizon 2020 website based on an interview with Neville Slack. The title of the article is " Garbage in, graphite out — plus green hydrogen" on the significance of graphite and hydrogen for the EU economy.

Available at: <https://ec.europa.eu/programmes/horizon2020/en/news/garbage-graphite-out-%E2%80%94-plus-green-hydrogen>


Garbage in, graphite out — plus green hydrogen

Published on 15/10/2015

It may look like rubbish, but food waste does have its uses. It could even be converted into valuable graphite and hydrogen. An EU-funded project has set out to do just that. The process it is developing combines anaerobic digestion with microwave plasma technology to transform trash into treasure.

The PlasCarb project intends to produce graphitic carbon — graphite — and green hydrogen, cost-effectively, from biogas. It is building a plant that could provide a blue-print for industrial-scale roll-out. One year into the project, the partners have already made considerable headway.

Synthetic graphite and sustainably produced hydrogen are substances of particular interest for the future. A cost-effective process to generate them from food waste such as potato peel and coffee grounds would solve two problems at once, securing a steady supply of valuable materials and helping to eliminate substantial amounts of waste.



© Patryssia - Fotolia.com



2.15 24 October 2016 – FhG IBP/GEO

A research report about Food Waste Statistics in Europe within the framework of Task 9.2 LCI has been conducted by FhG IBP and Geonardo Ltd. The report documents the investigation on four topic areas around food waste: (1) Food waste generation (2) food waste disposal options (3) causes of food waste and (4) price difference between different food waste management systems. This methodology was applied first on the context for EU-28 and in a second more in-depth investigation on national level for the PlasCarb partner countries France, Germany, Hungary, Norway and the United Kingdom.

The report is available at:

http://www.plascarb.eu/assets/content/20151208_FoodWasteReport_WP9_final_publish.pdf

http://www.plascarb.eu/news_and_events/plascarb/news/324



FOOD WASTE STATISTICS IN EUROPE: A NEW REPORT BY THE PLASCARB TEAM

24 February 2016

The PlasCarb team has just published a new report on Food Waste Statistics in Europe: it is available on our project website, under the Downloads section.

This report provides insight of different food waste management systems in EU-28 and more specifically for FR, DE, HU, NO and the UK.

Results of this investigation show that there are future needs for advanced food waste treatment approaches.

The PlasCarb project could be an appropriate approach to provide an advanced technological alternative for the use of food waste fraction.

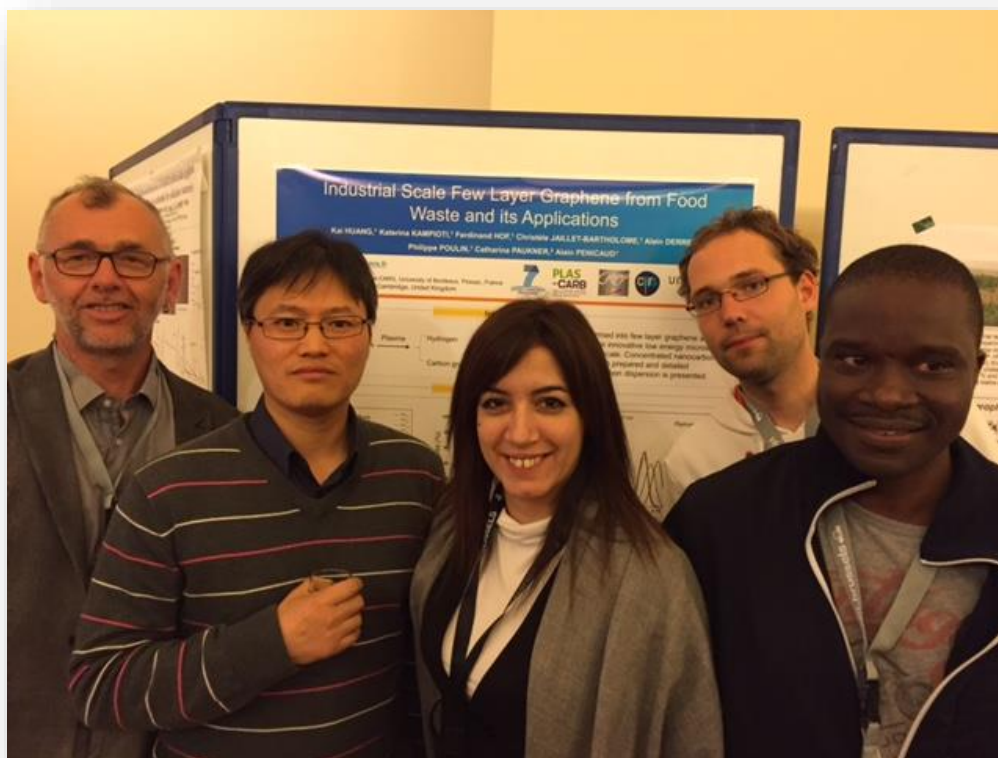
[READ MORE](#)



2.16 03 – 07 April 2016 – CNRS CRPP

The Plascarb project was represented at Chemontubes 2016, the international conference on the chemistry of graphene and carbon nanotubes in Brussels, Belgium, on April 3 - 7, 2016. <http://www.chemontubes.org/index.html>

Alain Penicaud, Katerina Kampioti, Kai Huang and Ferdinand Hof, Plascarb partners from CNR CRPP participated in this conference with two oral communications and a poster presentation. They presented the analysis and exploitation in a variety of applications of the high value graphitic carbon deriving from food waste within the framework of the Plascarb project.



Poster: „Industrial Scale Few Layer Graphene from Food Waste and its Applications”

Industrial Scale Few Layer Graphene from Food Waste and its Applications

Kai HUANG,¹ Katerina KAMPIOTI,¹ Ferdinand HOF,¹ Christèle JAILLET-BARTHOLOME,¹ Alain DERRE,¹ Philippe POULIN,¹ Catharina PAUKNER,² Alain PENICAUD¹

huang@crpp-bordeaux.cnrs.fr

Introduction

Food waste → Biogas → Plasma → Hydrogen / Carbon graphitic

Food waste can be transformed into few layer graphene and renewable hydrogen using an innovative low energy microwave plasma process at industrial scale. Concentrated nanocarbon dispersions in water have been prepared and detailed characterization of the nanocarbon dispersion is presented.

Results

▶ 0.345nm interplane distance → turbostratic graphite

▶ ~10-24% of total weight loss

▶ small size nanocarbon < 100nm after centrifugation

▶ size : 50 – 100 nm from HR-TEM

▶ mean size : 40nm
▶ mean thickness : 3 nm

- Conductivity test on the film by filtration of nanocarbon dispersion

Nanocarbon	Trial	Thickness (µm)	Sheet resistance (kΩ/□)	Volume resistivity (Ω.cm)	Average volume resistivity (Ω.cm)
NC _{HT3}	1	19	0.60	1.7	2
	2	22	1.24	2.7	
	3	31	0.63	1.6	
NC _{HT1}	1	8	1.00	0.8	0.88
	2	31	0.96	1.11	
	3	40	0.15	0.74	
NC _{HT2}	1	15	0.21	0.32	0.50
	2	15	0.32	0.47	
	3	18	0.22	0.39	
NC _{HT3}	1	10	1.65	2.1	1.48
	2	41	0.34	1.4	
	3	46	0.21	0.96	
NC _{HT4}	1	12	42.0	50	34.4
	2	31	6.00	16.6	

▶ Resistivity less than 20Ω.cm, possible application as conductive ink

Conclusion

So far, we have demonstrated :

- ▶ the graphitic nature nanocarbon which produced by plasma process from food waste,
- ▶ Reproducible nanocarbon dispersion preparation process with the optimized parameters,
- ▶ possibility to be used as conductive ink application.

ACKNOWLEDGMENT. This work was based on "Plascarb" project which is supported by EU in the framework of FP7. We thank Dr. C. Labrugère in ICMCB for XPS analyses.



Oral presentations:

- Ferdinand Hof: GICs of nanocarbons and their role as effective reducing agent (04 April 2016);

ChemOnTubes2016, April 3-7 2016, Brussels, Belgium.

GICs of nanocarbons and their role as effective reducing agent

Ferdinand Hof^{a,b}, Kai Huang^{a,b}, Katerina Kampioti^{a,b}, Catharina Paukner^c, Alain Derré^{a,b}, Alain Penicaud^{a,b}

^a CNRS, Centre de Recherche Paul Pascal (CRPP), UPR 8641, F-33600 Pessac, France.
^b Université Bordeaux, CRPP, UPR 8641, F-33600 Pessac, France.
^c FGV Cambridge Nanosystems, Cambridge, United Kingdom
 e-mail: hof@crpp-bordeaux.cnrs.fr

Despite the vast interest in graphene related research in the last decade, there are still fundamental hurdles to overcome in order to exploit their remarkable properties in tomorrow's applications.¹ The key issues can be summarized in either the challenge to yield a significant amount of thoroughly defect less and single layered material utilizing wet chemical approaches or its high cost applying CVD methods.²⁻³ Graphite intercalation compounds (GICs) are known for a century, and we have shown that by exfoliating these GICs in organic solvents single layered graphene can be yielded.⁴⁻⁵ We will present a rigorous study on nanosized graphitic material that can be intercalated successfully by potassium metal. Due to its size, and surface area it is an excellent precursor for exfoliating it in organic media that ensures simultaneously access to stable, concentrated, organic solutions.

Figure: Idealized scheme of a (nano)-composite of metal nanoparticle and nanosized graphene



- Katerina Kampiotti: When food waste is not wasted: Nanocarbon applications (05 April 2016)

ChemOnTubes2016, April 3-7 2016, Brussels, Belgium.

When food waste is not wasted: Nanocarbon applications

Katerina Kampiotti^{a,b}, Carolina Ferreira de Matos^c, Kai Huang^{a,b}, Catharina Paukner^d,
Christèle Jaillet-Bartholome^{a,b}, Alain Derré^{a,b}, Fernando Galembek^f, Aldo José Gorgatti
Zarbin^c, Alain Pénicaud^{a,b}

^a Centre de Recherche Paul Pascal-CNRS, Bordeaux, France, ^b University of Bordeaux, France, ^c Federal university of Parana, Brazil, ^d FGV Cambridge Nanosystems, Cambridge, United Kingdom, ^e University of Campinas, Brazil
e-mail: kampiotti@crpp-bordeaux.cnrs.fr

The European Parliament considers that food waste is wasteful of resources. However, food waste can be transformed into high value nanocarbon and renewable hydrogen through energy efficient transformation of methane resulting from decomposition of food waste.¹

After **purification, well defined, high concentration dispersions of nanocarbon, calibrated in size were obtained and characterized.** Several are the uses of the nanocarbon dispersions: In batteries, as carbon dots or as fillers in polymer composites. In this presentation will be emphasized the use of nanocarbon as rubber fillers with a brief report of other nanocarbon applications.

Multifunctional nanocomposites with natural rubber latex (NR) were prepared by an environmentally friendly route that some of us have developed with carbon nanotubes and graphene species.^{2,3} NR is a natural polymer composed mainly of poly (cis-1,4-isoprene). The preparation of NR nanocomposites with nanocarbon (NC) aims to **combine synergistically the properties of the two materials**, thereby extending these application possibilities. We will report on these homogeneous nanocomposites and their thermal, electrical, mechanical and chemical properties. Due to their electrical properties, these materials could be characterized as conductive composites with a correlation of their mechanical and electrical properties. The obtained multifunctional materials exhibit promising characteristics with potential for applications in a large number of systems.

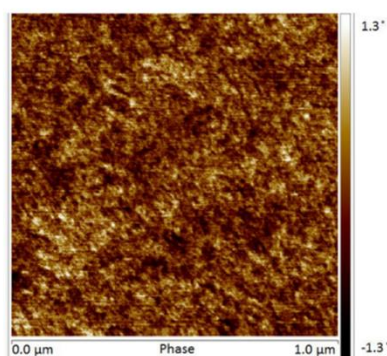


Figure 1: Representative AFM phase image of the NC/NR composites.

References

1. European community funded FP7 project PLASCARB. <http://www.plascarb.eu/>
2. Carolina F. Matos, Fernando Galembek, Aldo J.G. Zarbin, Carbon 50 **2012**, 4685-4695
3. Carolina F. Matos, Fernando Galembek, Aldo J.G. Zarbin, Carbon 78 **2014**, 469-479



2.17 27 April 2016 - CNS

A presentation has been held by Dr. Anna Mieczakowski from Cambridge Nanosystems (CNS) at IDTechex Graphene and 2D Materials in Berlin, Germany with the topic “Cost-Effective, Green, One-Step Process For Producing Ultra-High-Quality Graphene”. She introduced the PlasCarb technology and its products.

More information: Access the speaker’s introduction via this [link](#) and the [news](#) article on the PlasCarb webpage



The screenshot shows a presentation slide with the following content:

- Logos:** FGV and Cambridge Nanosystems.
- Title:** Cost-Effective, Green, One-Step Process For Producing Ultra-High-Quality Graphene
- Company:** Cambridge Nanosystems, UNITED KINGDOM
- Speaker:** Dr Anna Mieczakowski, Chief Operating Officer (with a circular profile picture).
- Event Details:** Room 5, Wednesday, 27 April 2016, 17:10 - 17:35.
- Section:** Presentation Summary
- Summary Text:** Dr Anna Mieczakowski, the Chief Operating Officer at FGV Cambridge Nanosystems, will present her Company's cost-effective and green graphene production method that turns waste greenhouse gases, such as methane and carbon dioxide, into ultra-high-quality graphene, in one, very efficient, step. This novel method is based on advanced plasma chemistry.
- Call to Action:** Register to see this speaker (yellow button).

IDTECHEX GRAPHENE AND 2D MATERIALS

27- 28 April 2016

Berlin, Germany

We are happy to announce that PlasCarb will be presented at the IDTechEx Graphene and 2D Materials event in Berlin, Germany, on the 27th and 28th April, 2016.

One of our project partners, Dr. Anna Mieczakowski, from Cambridge Nanosystems will present the PlasCarb project and her company's profile focussing on "[Cost-Effective, Green, One-Step Process For Producing Ultra-High-Quality Graphene](#)". The presentation will take place in Room 5 on Wednesday, 27th April 2016 from 17:10 to 17:35 (UTC +1).

The Graphene and 2D Materials event is the most commercially-focused conference and exhibition on graphene and other 2D materials. It is where companies unveil their latest technologies, launch their products, where technologists announce their latest commercially-relevant results, and where suppliers and end users from a variety of industries directly connect.



2.18 2 May 2016 - CPI

Based on an interview with Neville Slack, an article in the Clean India Journal about “Transforming garbage into treasure” introduces and describes PlasCarb as an innovative method of transforming food waste into a high-value product. The article is available under this [link](#).

Transforming garbage into treasure

Posted by: [Clean India Journal - Editor](#) May 2, 2016 in [Waste Management](#) Comments Off




It may look like rubbish, but food waste does have its uses. It could even be converted into valuable graphite and hydrogen. An EU-funded project is setting out to do just that. The process being developed combines established Anaerobic Digestion (AD) with an innovative Microwave Plasma technology to transform waste into treasure.



2.19 22 – 26 May 2016 – CNRS CRPP

The PlasCarb project was represented at 10th International Conference on New Diamond and Nano Carbons in Xi'an, China, on May 22 – 26, 2016. Kai Huang, PlasCarb partner from CNRS CRPP, participated in this conference and presented one poster. The presentation title is Industrial Scale Few Layer Graphene from Food Waste and its Application as Conductive Ink.




PLASCARB
Innovative plasma based transformation of food waste into high value graphitic carbon and renewable hydrogen

Industrial Scale Few Layer Graphene from Food Waste and its Application as Conductive Ink (EU project: PLASCARB)

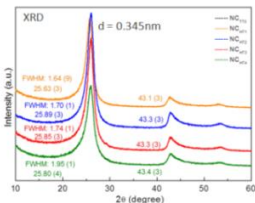
Kai Huang,¹ Katerina Kampouri,² Ferdinand Hof,¹ Christophe Jallet-Bartholome,¹ Alain Derne,¹ Philippe Poulin,¹ Catharina Pauline,² and Alain Pericau³
¹Centre de Recherche Paul Pascal-CNRS, University of Bordeaux, France
²FGV Cambridge Nanosystems, Cambridge, United Kingdom
³Yuang@crpp-bordeaux.cnrs.fr

INTRODUCTION

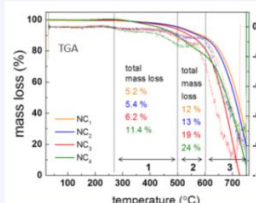
Food waste can be transformed into few layer graphene and renewable hydrogen using an innovative low energy microwave plasma process at industrial scale (see process chart on the right side). Concentrated nanocarbon dispersions in water have been prepared and detailed characterization of the nanocarbon dispersion is presented.



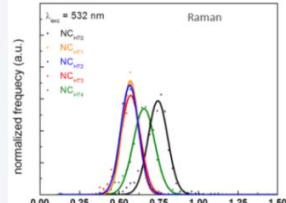
Nanocarbon produced by plasma process



> 0.345nm interplane distance → turbostratic graphite

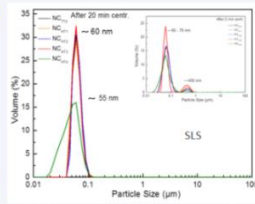


> ~10-24% of total weight loss

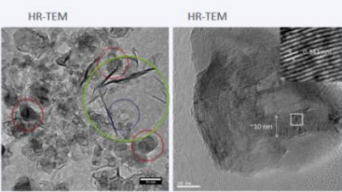


> $\lambda_{exc} = 532 \text{ nm}$

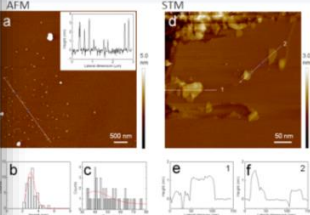
Nanocarbon dispersions



> small size nanocarbon < 100nm after centrifugation



> size : 50 – 100 nm from HR-TEM



> mean size : 40nm > mean thickness : 3 nm

Conductivity test on the film by filtration of nanocarbon dispersions					
Nanocarbon	Trial	Thickness (µm)	Sheet resistance (kΩ/□)	Volume resistivity (Ω.cm)	Average volume resistivity (Ω.cm)
NC wt.0	1	19	0.99	1.7	
	2	22	1.24	2.7	2
	3	31	0.53	1.6	
NC wt.1	1	8	1.00	0.8	
	2	31	0.36	1.11	0.88
	3	49	0.15	0.74	
NC wt.2	1	15	0.21	0.32	
	2	15	0.32	0.47	0.39
	3	18	0.22	0.39	
NC wt.3	1	10	1.65	2.1	1.48
	2	41	0.34	1.4	
	3	46	0.21	0.96	
NC wt.4	1	12	42.0	50	
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> Resistivity less than 20Ω.cm, possible application as conductive ink


Conclusion


Up to far, we have demonstrated:
 - the graphitic nature nanocarbon which produced by plasma process from food waste,
 - Reproducible nanocarbon dispersion preparation process with the optimized parameters,
 - possibility to be used as conductive ink application.


ACKNOWLEDGMENT. The Plascarb project is supported by EU in the framework of FP7.


CONTACT NEVILLE SHAO, Scientific Coordinator, Project Manager, Centre for Process Innovation Ltd. (CPI)
 Address: Winton Centre, Winton, Redcar, Teesside, TS10 4BP Phone: +44 (0) 1642 442474 E-mail: neville.shao@cpil.co.uk Web: www.plascarb.eu


PARTNERSHIP


 Centre for Process Innovation (UK)


 Cambridge Nanosystems

 National Centre for Scientific Research

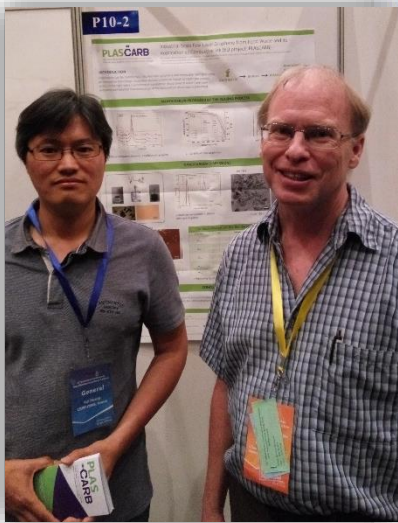
 Fraunhofer Institute for Building Physics - IPT - Fraunhofer

 SAP (In-Service Management)

 GEONARDO Geonardo Ltd.

 Asabony Asabony

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement No 603488



2.20 1 July 2016 – FhG IBP

An extensive article in German language about PlasCarb and the work of the researchers at the FhG IBP was published on their webpage and in the annual report of FhG IBP 2015, featured as one of the highlights from research and development.

Available at: <http://www.ibp.fraunhofer.de/de/highlight-themen/plascarb.html> and https://www.ibp.fraunhofer.de/content/dam/ibp/de/documents/Publikationen/Jahresbericht/ibp_226_JB15_rz_web.pdf

Plascarb - Verborgene Potenziale aus Lebensmittelabfällen nutzbar machen



© Foto K. Kampiot/CNRS

Ist weg gleich weg? Was Lebensmittel angeht, ist Deutschland eine Wegwerfnation...

Bis zu einem Drittel der gesamt produzierten Lebensmittel gehen über die Wertschöpfungskette verloren. Sprich: Sie landen in der Tonne, während gleichzeitig in vielen Regionen der Erde Hungersnöte herrschen. Es ist eine nachhaltige Optimierung nötig – beispielsweise in Hinblick auf Flächenbedarf, Ressourcenausbeutung und Treibhausgasemissionen, die mit der Produktion der Lebensmittel einhergehen. Zudem landet wertvolle Energie, die für die Bereitstellung der Lebensmittel benötigt wurde, direkt und ungenutzt im Müll.

Hier setzt das Projekt PlasCarb an, ein von der EUKommission gefördertes Forschungsvorhaben, das Partner aus fünf Ländern vereinigt. Es geht nicht darum, die Lebensmittelverschwendung per se einzudämmen, was keine triviale Angelegenheit darstellt, sondern vielmehr darum, die im Abfall enthaltene Energie und das stoffliche Potenzial nutzbar zu machen. Das Projekt baut dabei auf einer etablierten Technologie auf: der biologischen Vergärung organischer Abfälle. Mithilfe des neuen Verfahrens soll es künftig möglich sein, die Abfälle nicht nur energetisch, sondern auch stofflich zu recyceln – oder sogar upzucyclen.

PLASCARB

VERBORGENE POTENZIALE AUS
LEBENSMITTELABFÄLLEN NUTZ-
BAR MACHEN



2.21 4 July 2016 – FhG IBP

The presentation “From food waste to graphitic carbon – a sustainable development?” at the 28th European Conference on Operational Research in Poznan, Poland: was held by FhG IBP. The presentation showed the findings of LCA within regional and future scenarios.

More information at: https://www.euro-online.org/conf/euro28/treat_abstract?paperid=2266

From food waste to graphitic carbon – a sustainable development?

Christian Peter Brandstetter¹; Florian Gehring²; Eva Knüpffer²; Stefan Albrecht²

¹ *University of Stuttgart, Chair of Building Physics, Department Life Cycle Engineering, Wankelstr. 5, 70563 Stuttgart, Germany*

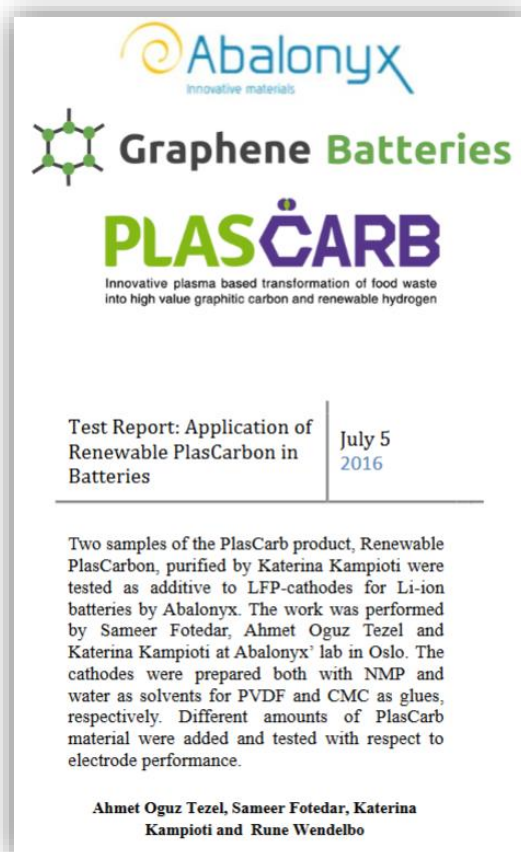
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The slide features the PLAS CARB logo at the top left, with 'PLAS' in green and 'CARB' in purple. Below the logo is the text: 'INNOVATIVE PLASMA BASED TRANSFORMATION OF FOOD WASTE INTO HIGH VALUE GRAPHITIC CARBON AND RENEWABLE HYDROGEN'. The main title 'FROM FOOD WASTE TO GRAPHITIC CARBON – A SUSTAINABLE DEVELOPMENT?' is centered in white on a green background. Below the title, the presenter's name 'Florian Gehring' and affiliation 'Fraunhofer Institute for Building Physics (FhG-IBP) Department Life Cycle Engineering (GaBi)' are listed. The event details 'European Conference on Operational Research, Poznan 04th July 2016' are at the bottom. A small European Union logo and funding information are in the bottom left corner.



2.22 5 July 2016 – Abalonyx

A [test report](#) by Abalonyx on a common research venture of the PlasCarb partners CNRS CRPP and Abalonyx was published on the PlasCarb webpage. In the test report, the researchers investigate the applicability of Renewable PlasCarbon as conductive filler in cathodes of batteries. A [news](#) article has been published on the PlasCarb web site to promote the article.



TEST REPORT: APPLICATION OF RENEWABLE PLASCARBON IN BATTERIES

12 October 2016

PlasCarb researchers from the teams at [Abalonyx](#), Norway, and [CNRS](#), France, published a report on their study from July 2016. Together with colleagues from [Graphene Batteries](#), a norwegian SME, they tried to answer the question whether and how Renewable PlasCarbon (RPC) can be efficiently applied in market-available batteries and whether it can compete against carbon black being conventionally used for this purpose.

RPC is a graphitic nanocarbon powder, characteristically placed between graphene and carbon black, and is the resulting product of the PlasCarb technology. The technology incorporates a number of value chain components for the innovative up-cycling of food waste to high value materials such as the RPC.

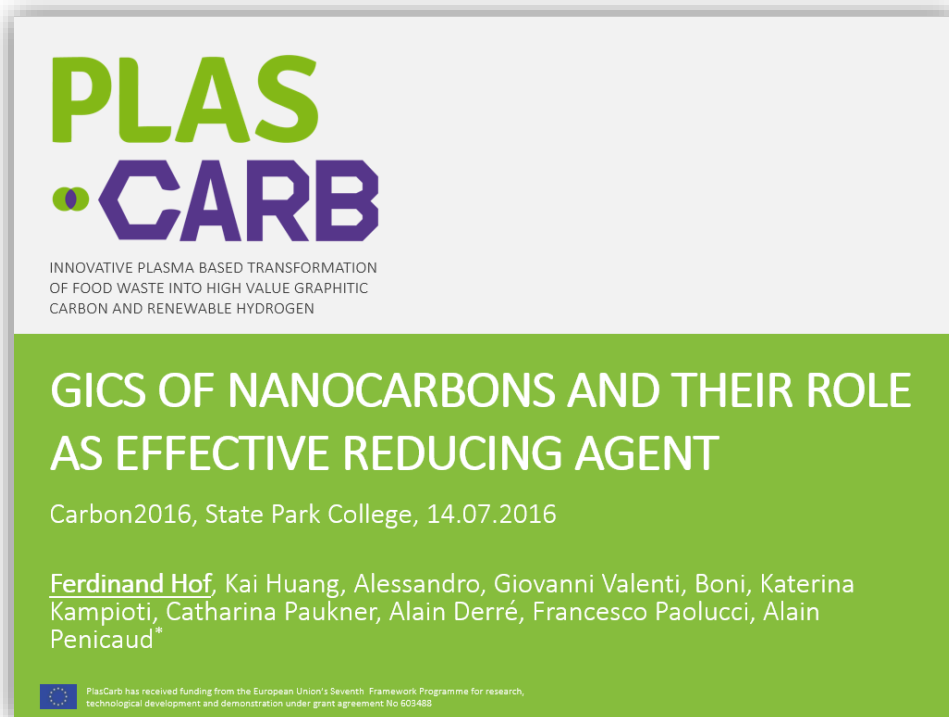
Please follow [this link](#) to download the test report and find out more about the methodologies, procedures and final conclusions of this cooperative work.



2.23 14 July 2016 – CNRS CRPP

A presentation with the title: “GICs of Nanocarbons and their Role as Effective Reducing Agent” was held at the CARBON 2016 conference – The World Conference on Carbon in Pennsylvania, USA.

A [news article](#) promoting the participation of the PlasCarb partner Ferdinand Hof as well as the presentation abstract was published on the PlasCarb webpage.



PLAS CARB

INNOVATIVE PLASMA BASED TRANSFORMATION OF FOOD WASTE INTO HIGH VALUE GRAPHITIC CARBON AND RENEWABLE HYDROGEN

GICS OF NANOCARBONS AND THEIR ROLE AS EFFECTIVE REDUCING AGENT

Carbon2016, State Park College, 14.07.2016

Ferdinand Hof, Kai Huang, Alessandro, Giovanni Valenti, Boni, Katerina Kampioti, Catharina Paukner, Alain Derré, Francesco Paolucci, Alain Penicaud*

PlasCarb has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement No 603488

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INTRODUCTION

Graphite intercalation compounds (GICs) can be readily exfoliated to monolayer graphene in organic solvents without sonication treatment by stirring. These GIC solutions are composed of charged graphene layers.^{1,2} Due to their size and surface area, graphitic nano carbons are an interesting and promising carbon alternative for various applications. In this study, sustainable synthetic graphitic nano carbons have been used as starting material to synthesize metal nanoparticle/nano carbon composite materials with remarkable electrocatalytic activity.



2.24 27 July 2016 – CNRS CRPP

Two scientific presentations to research aspects of the PlasCarb project were given by the researchers Alain Pénicaud and Ferdinand Hof from CNRS CRPP CNRS at PlasCarb’s first industry seminar at the ANM 2016 in Aveiro, Portugal.

- Alain Pénicaud: "Multi-Layer Graphene from Food Waste & Additive Free Single Layer Graphene in Water".

Multi Layer Graphene from Food Waste & Additive Free Single Layer Graphene in Water

Alain Pénicaud
 CNRS, Centre de Recherche Paul Pascal (CRPP), France.
 Univ. Bordeaux, France .

- Ferdinand Hof: "Charged Nanocarbons as Effective Reducing Agent in Nanoparticle Synthesis", abstract available at: <http://www.plascarb.eu/assets/content/ANM-2016-abstractHOF.pdf>



Charged Nanocarbons as Effective Reducing Agent in Nanoparticle Synthesis

Ferdinand Hof^{1,2}, Kai Huang^{1,2}, Alessandro Boni³, Giovanni Valenti³, Katerina Kampioti^{1,2}, Alain Derré^{1,2}, Catharina Paukner⁴, Francesco Paolucci³, Alain Penicaud^{1,2*}

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INTRODUCTION

Graphitic nano carbons are promising carbon based alternative for various novel applications due to their size and surface area. In this study, sustainable synthetic graphitic nano carbons have been used as starting material to synthesize metal nanoparticle/nano carbon composite materials with remarkable electro catalytic activity.

reduction agent can be avoided, and only a single by-product is generated.

Carbon nano materials are promising materials for electro catalytic application thanks to their high surface areas, electrical conductivity and stability in acidic or basic aqueous solutions.^{8,9}

This as-produced material exhibits a unique size



2.25 10 August 2016 - CNS

PlasCarb's partner organisation CNS published an [article](#) on the company's webpage with the following title: "Converting food waste into highly sought after graphene and hydrogen". The article was re-posted on the PlasCarb webpage and is available as [news article](#) on the PlasCarb website, and as a [news article](#) on the CNS website

CONVERTING FOOD WASTE INTO HIGHLY SOUGHT AFTER GRAPHENE AND HYDROGEN

10 August 2016






2.26 22 September 2016 - CNRS/CNS

A scientific article published by the researchers of CNRS and CNS: “Conductive inks of graphitic nanoparticles from a sustainable carbon feedstock”. The article proved that RPC performs equally to the commercially available but fossils-based carbon black.

Read the [Article](#) on Science Direct, or the [news](#) on the PlasCarb webpage.

Conductive inks of graphitic nanoparticles from a sustainable carbon feedstock

[Ferdinand Hof](#)^{a, b, 1}, [Katerina Kampioti](#)^{a, b, 1}, [Kai Huang](#)^{a, b, 1}, [Christèle Jaillet](#)^{a, b}, [Alain Derré](#)^{a, b}, [Philippe Poulin](#)^{a, b}, [Hisham Yusof](#)^c, [Thomas White](#)^c, [Krzysztof Koziol](#)^c, [Catharina Paukner](#)^c,  , [Alain Pénicaud](#)^{a, b},  

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<http://dx.doi.org/10.1016/j.carbon.2016.09.052>

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Abstract

Microwave plasma splitting of biogas to solid carbon forms is a promising technique to produce large quantities of sustainable carbon based nano materials. Well defined graphitic nano carbons have been produced exhibiting graphene multilayers in turbostratic packing. After heat treatment, the purified material has been used to formulate stable, aqueous dispersions. These dispersions are used directly as inks, allowing the preparation of conductive membranes with remarkable resistivity. Nano carbons derived by plasma processes constitute a promising alternative to carbon black because they can be prepared from renewable sources of methane or natural gas, are calibrated in size, exhibit high conductivity, and have promising perspectives for chemical and material science purposes.

PLASCARB PUBLICATION: CONDUCTIVE INKS OF GRAPHITIC NANOPARTICLES FROM A SUSTAINABLE CARBON FEEDSTOCK

22 September 2016

WHY GREEN IS THE NEW BLACK: PLASCARB RESEARCHERS PUBLISH A STUDY TO PROVE THAT SUSTAINABLE GRAPHITIC CARBON IS A WORTHY COMPETITOR TO THE MARKET-LEADING CARBON BLACK

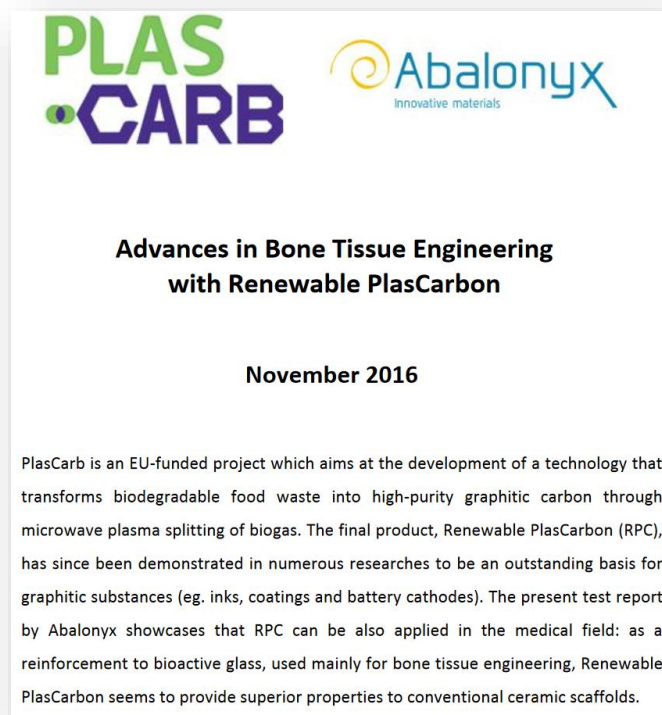
A new research conducted by the PlasCarb team managed to reveal important scientific discoveries. Firstly, microwave plasma splitting of biogas seems to be a promising technique to produce large quantities of highly sought-after carbon-based materials such as graphitic nano carbons. Secondly, these graphitic particles proved to constitute an excellent basis for conductive inks or coatings. The substance has been tested against the properties of the commercially available carbon black and the results have shown that it can indeed perform equally to its competitor while it could be generated from food waste, a renewable resource. Based on these findings, it is safe to say that through further exploration and exploitation this technology might be the key to warrant a steady supply of state-of-the-art graphitic materials in the face of growing demand.




2.27 10 November 2016 - Abalonyx

The newest study by Abalonyx showed that RPC is a highly effective additive to bioglass as a replacement bone scaffold for transplantation.

Advances in Bone Tissue Engineering with Renewable PlasCarbon”: on the [PlasCarb website](#) and [the article](#).



PLAS CARB 

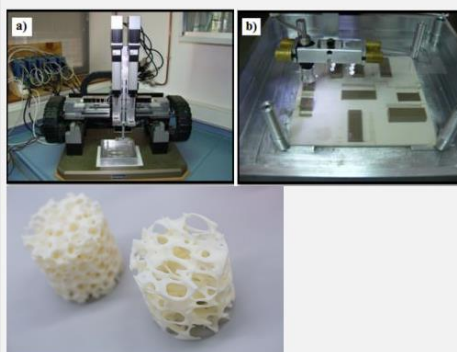
Advances in Bone Tissue Engineering with Renewable PlasCarbon

November 2016

PlasCarb is an EU-funded project which aims at the development of a technology that transforms biodegradable food waste into high-purity graphitic carbon through microwave plasma splitting of biogas. The final product, Renewable PlasCarbon (RPC), has since been demonstrated in numerous researches to be an outstanding basis for graphitic substances (eg. inks, coatings and battery cathodes). The present test report by Abalonyx showcases that RPC can be also applied in the medical field: as a reinforcement to bioactive glass, used mainly for bone tissue engineering, Renewable PlasCarbon seems to provide superior properties to conventional ceramic scaffolds.

ADVANCES IN BONE TISSUE ENGINEERING WITH RENEWABLE PLASCARBON

10 November 2016



Renewable PlasCarbon, the graphitic nanocarbon created by the PlasCarb technology has been tested by [Abalonyx](#) as a reinforcement to bioglass. This material is used for the generation of transplantable bone tissue scaffolds. With an increased demand for bone transplantation, it becomes especially important that the scaffolds have the most favourable properties for a fast regeneration of the fractures and injuries. According to the tests made by Abalonyx, RPC seems to possess an enhancing effect on the tissues compared to conventional ceramic scaffolds. To learn more about the testing and its results, download the report from our [downloads section](#).

