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

PLASCARB

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

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, 30th 2016

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

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

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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.

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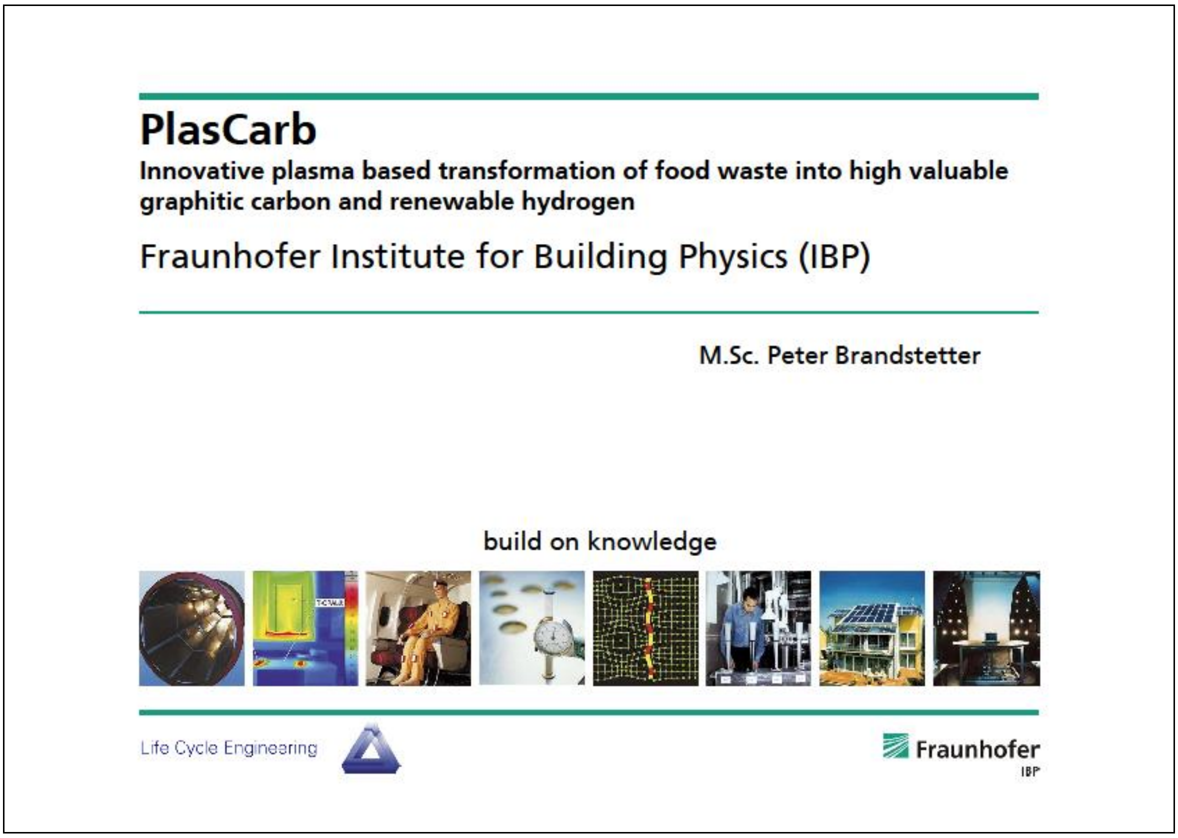
2 DISCLOSURES FOR PUBLICATION

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



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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.

Krisztina Tóth

25 March 2014

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]

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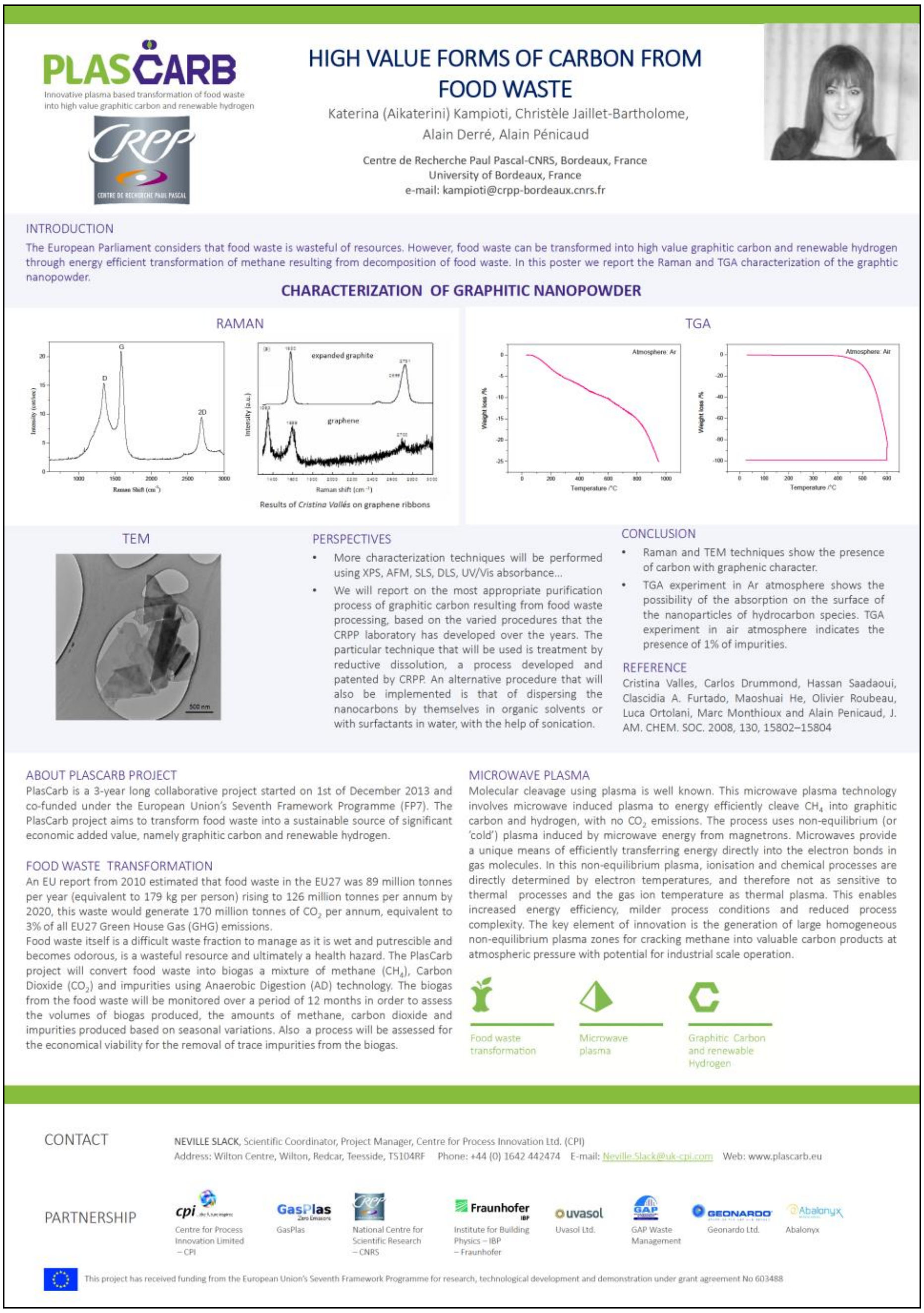
2.3 30 March 2014 – CRPP CNRS

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/



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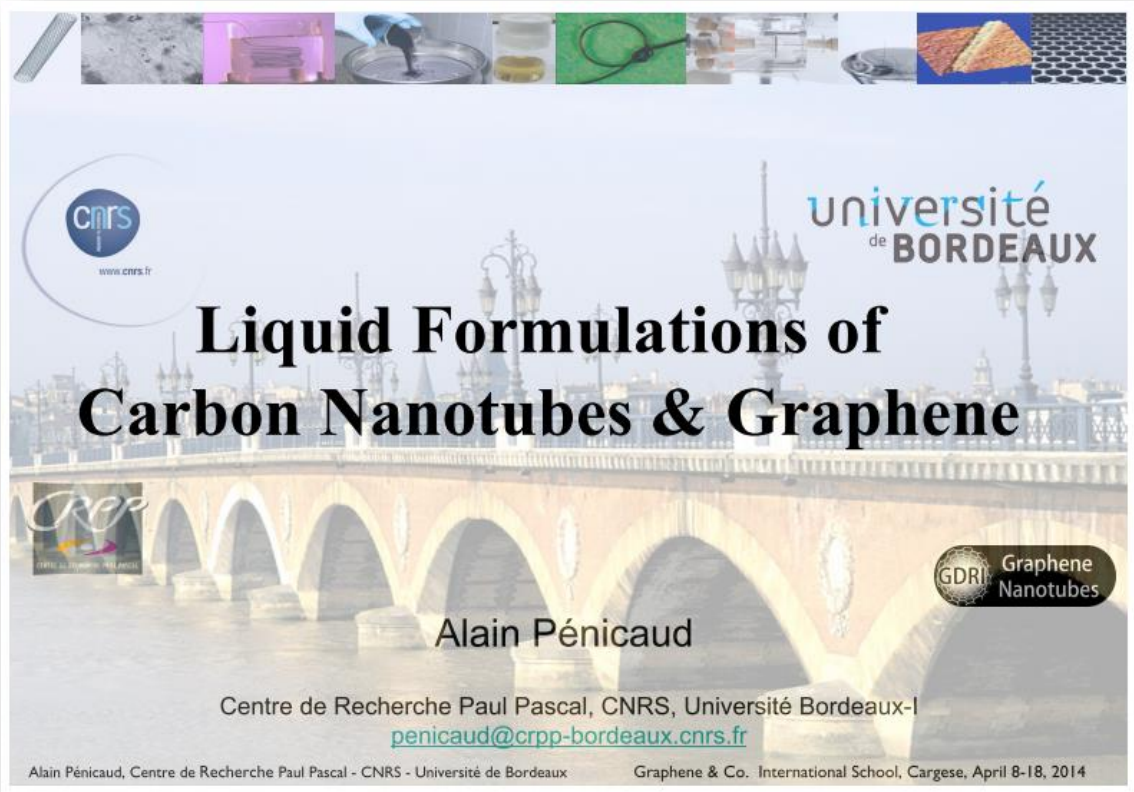
2.4 08 April 2014 – CNRS CRPP

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



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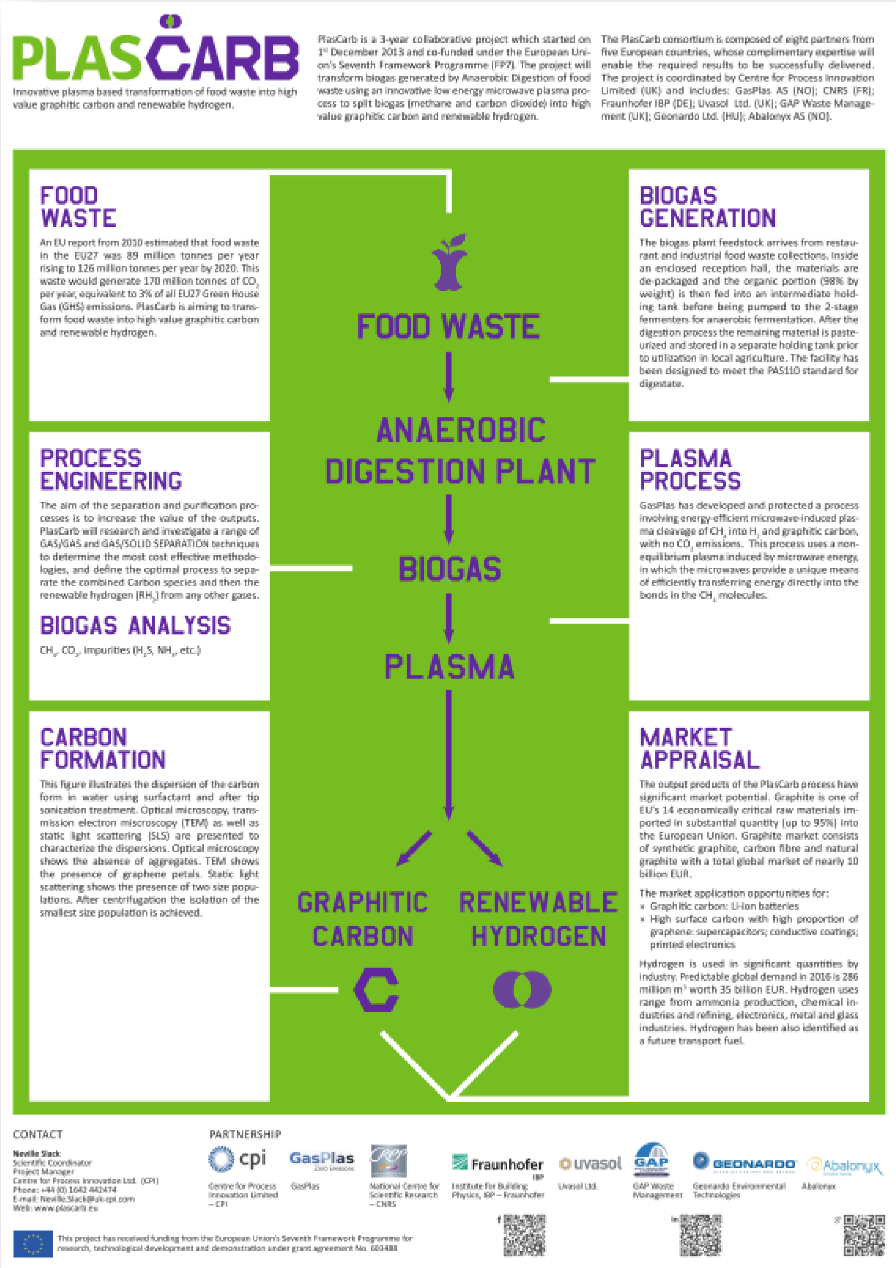
2.5 15 October 2015 - CPI

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



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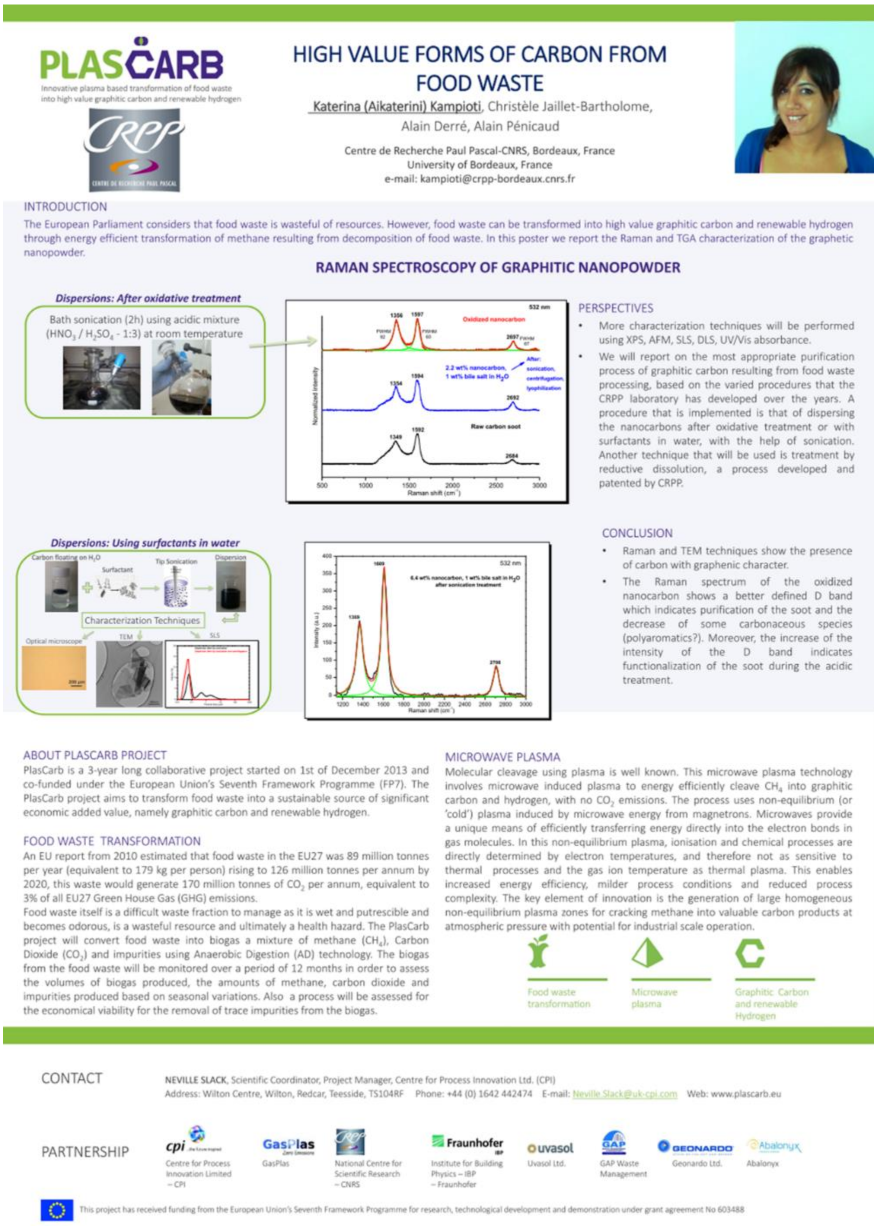
2.6 17 October 2014 – CNRS CRPP

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



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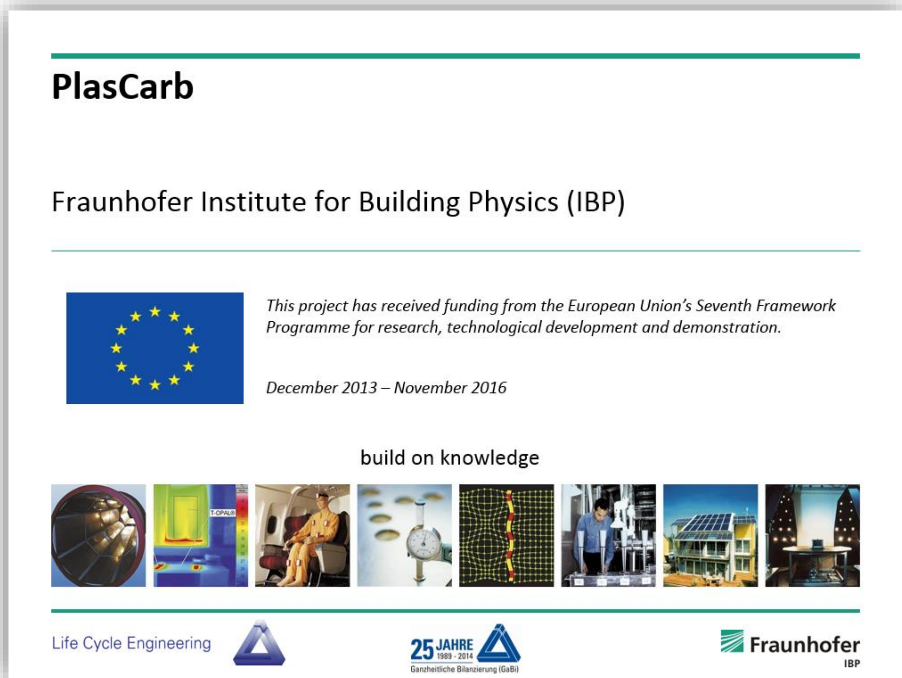
2.7 07 November 2014 – FhG IBP

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, SãoPaulo, 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

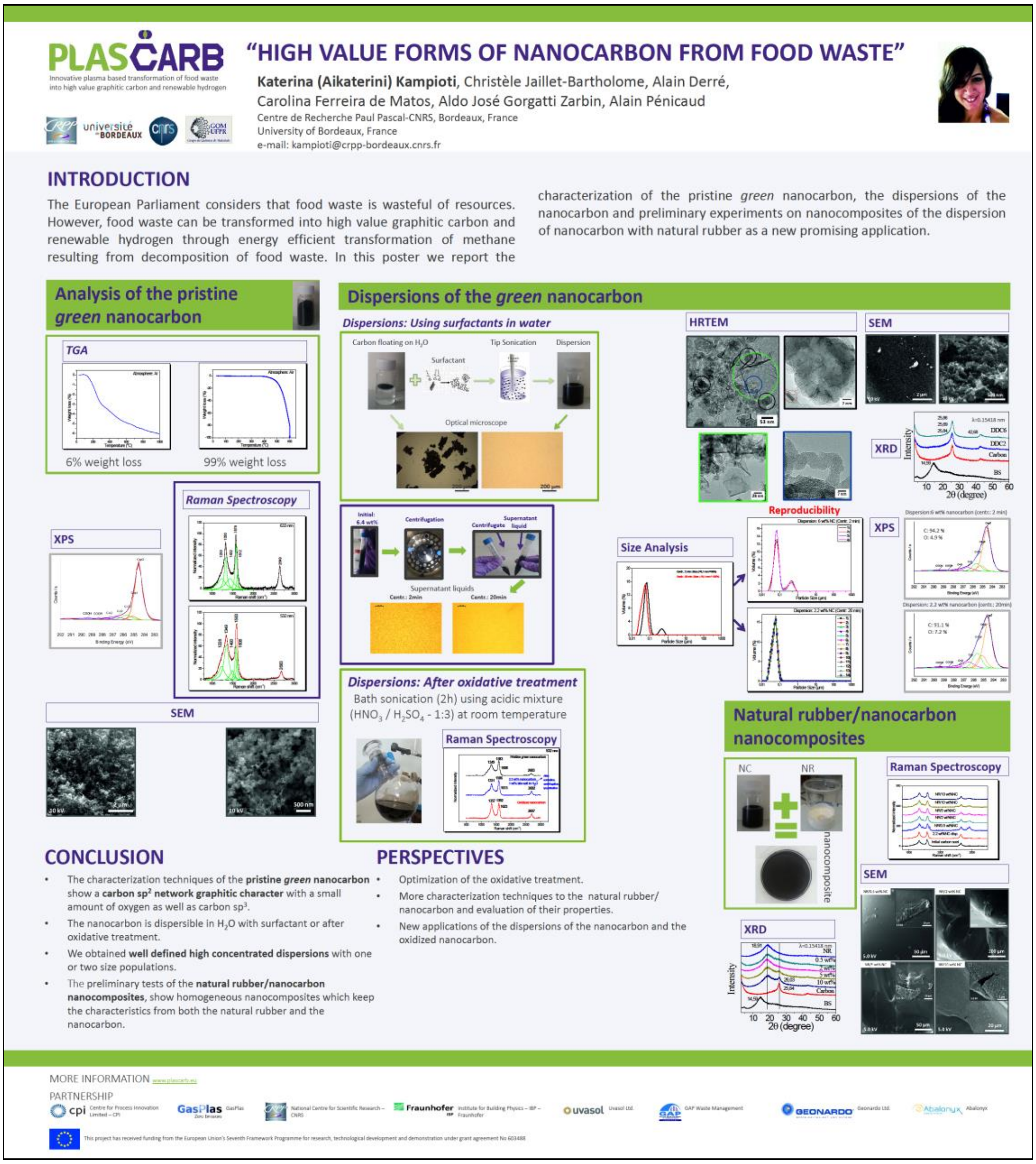
C.P. Brandstetter [1] , J. Gantner [2] , K. Grönman [3] , F. Gehring [1], 1 Fraunhofer-Insititute for Building Physics, Germany, 2 University of Stuttgart, Germany, 3 Lappeenranta University of Technology, Finland



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.

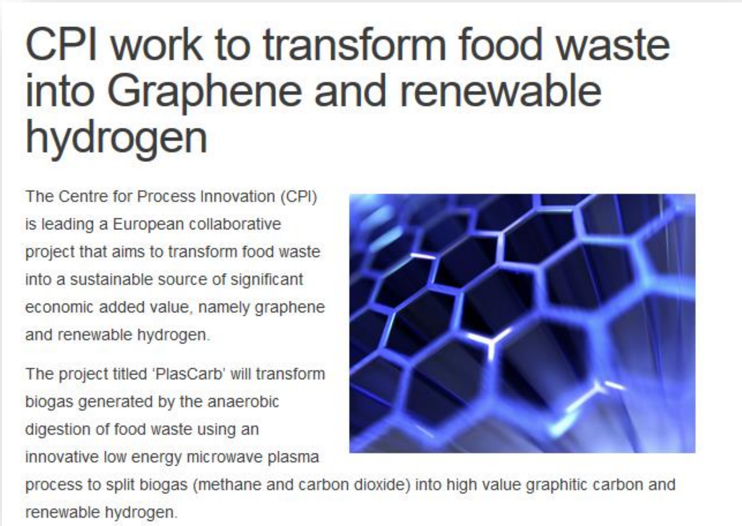


This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement No 603488

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.

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

2.10 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

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

2.11 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 …

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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]

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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

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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.

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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.

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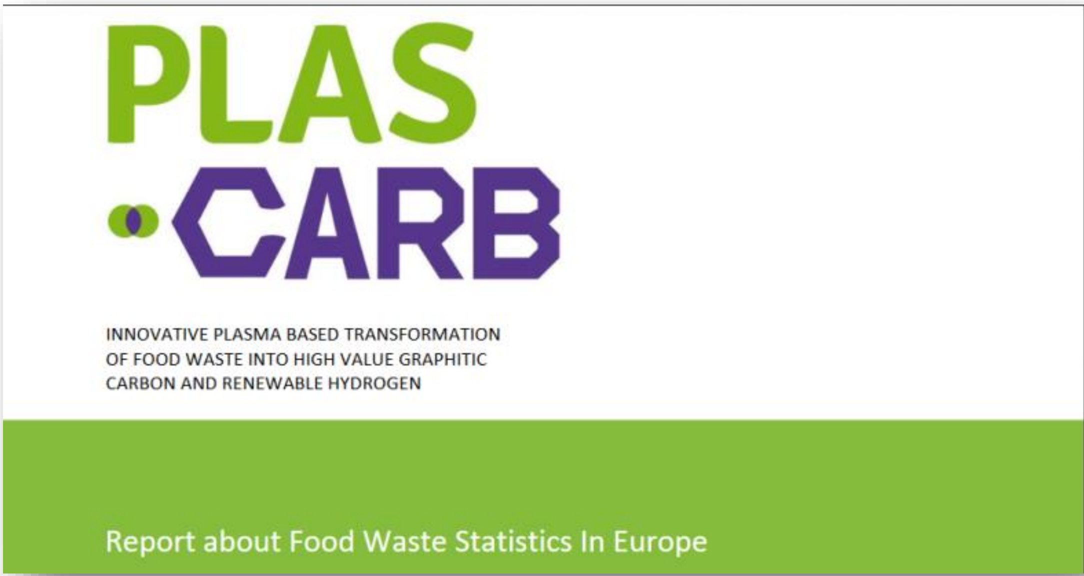
2.15 24 October 2016 – FhG IBP/GEO

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

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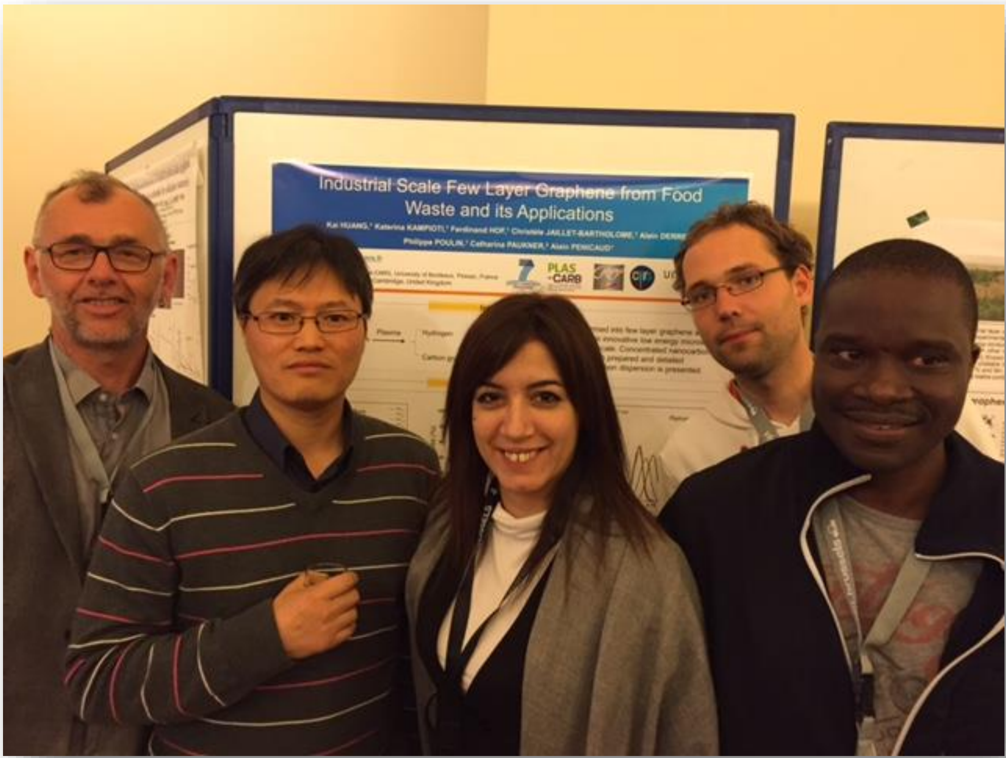
2.16 03 – 07 April 2016 – CNRS CRPP

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.



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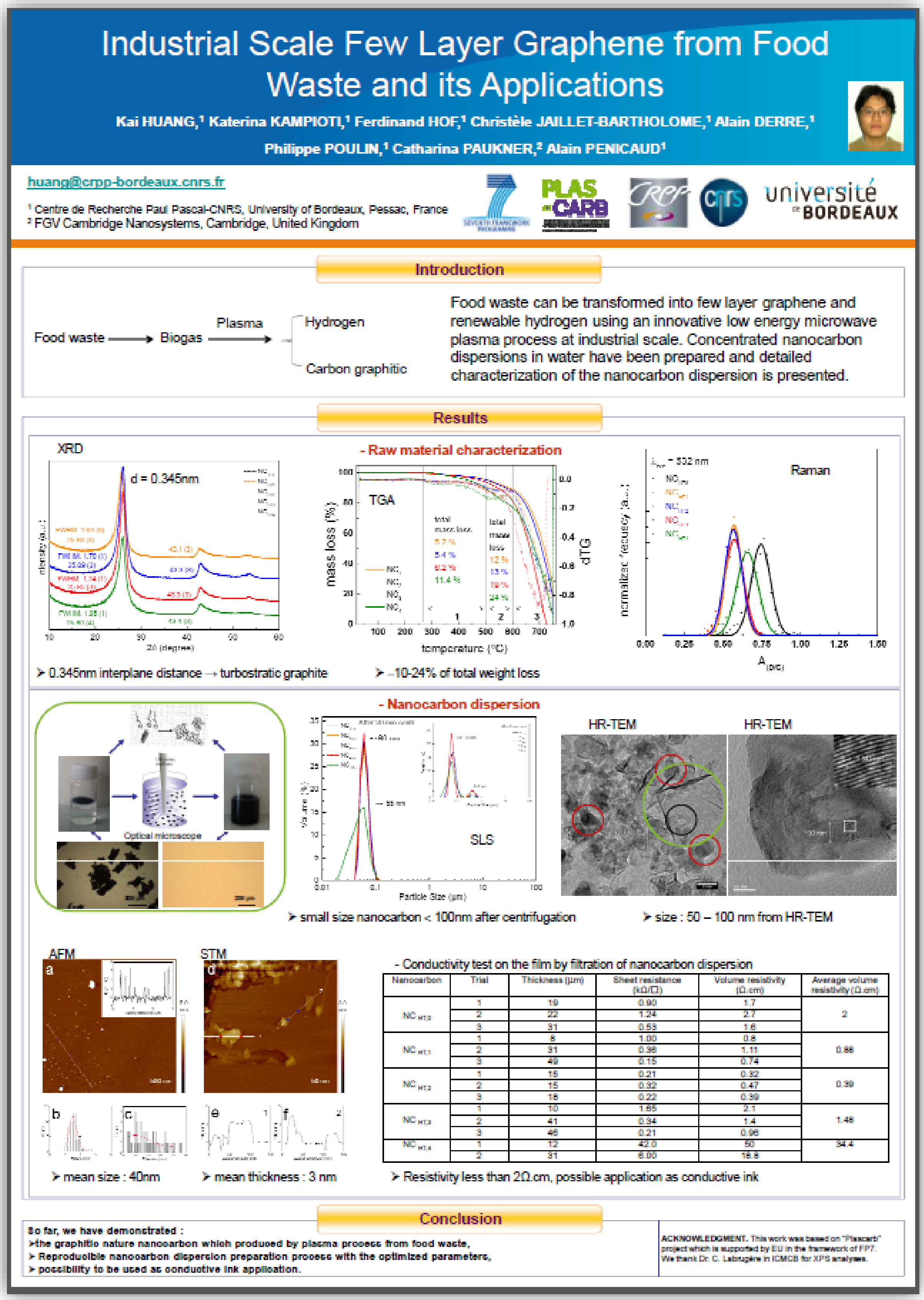
Poster: „Industrial Scale Few Layer Graphene from Food Waste and its Applications"



Nanocarbon	Trial	Thickness (µm)	Sheet resistance (kΩ/□)	Volume resistivity (Ω.cm)	Average volume resistivity (Ω.cm)
NC HT,0	1	19	0.90	1.7	2
	2	22	1.24	2.7	
	3	31	0.53	1.6	
NC HT,1	1	8	1.00	0.8	0.88
	2	31	0.36	1.11	
	3	49	0.15	0.74	
NC HT,2	1	15	0.21	0.32	0.39
	2	15	0.32	0.47	
	3	18	0.22	0.39	
NC HT,3	1	10	1.65	2.1	1.48
	2	41	0.34	1.4	
	3	46	0.21	0.96	
NC HT,4	1	12	42.0	50	34.4
	2	31	6.00	18.8	

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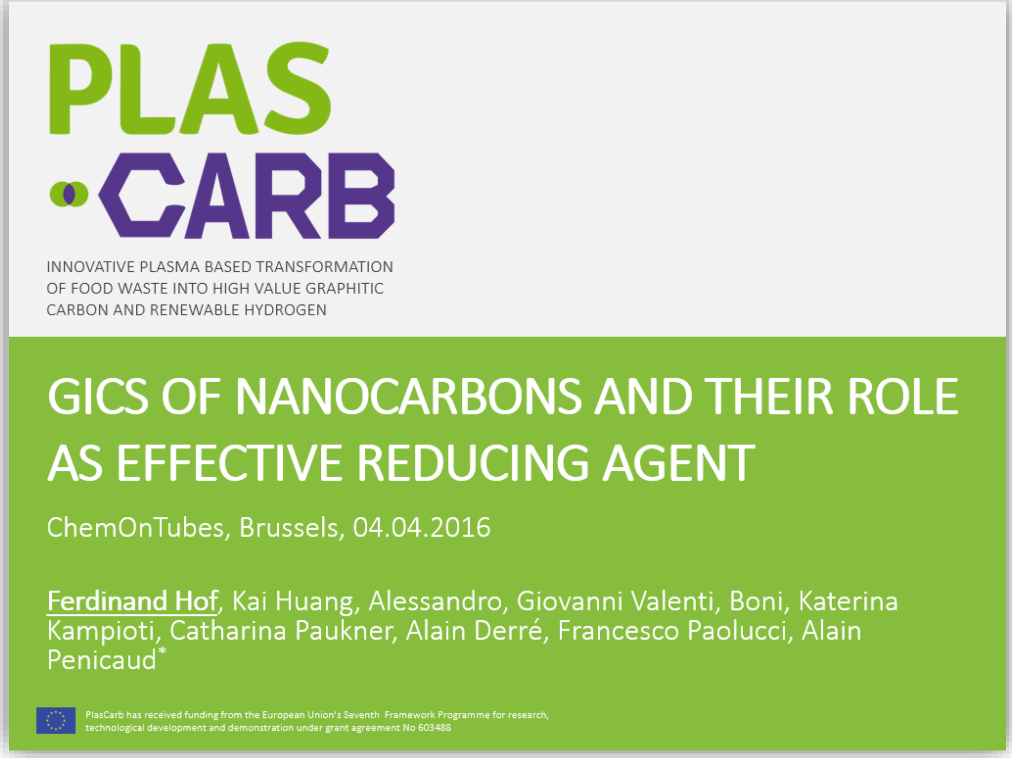
Oral presentations:

- 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, the 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.

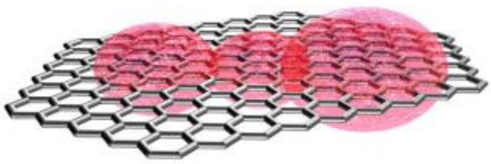


Figure: Idealized scheme of a (nano)-composite of metal nanoparticle and nanosized graphene

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

- Katerina Kampioti: 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 Kampioti [a,b], Carolina Ferreira de Matos [c], Kai Huang [a,b], Catharina Paukner [d], Christèle Jaillet-Bartholome [a,b], Alain Derré [a,b], Fernando Galembeck [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, [f] University of Campinas, Brazil
e-mail: kampioti@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.

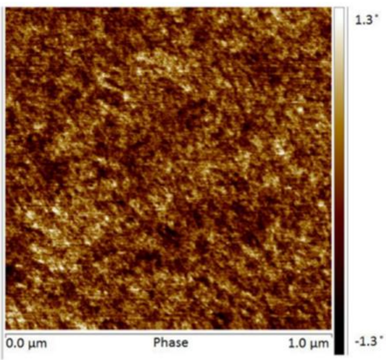


Figure 1: Representative AFM phase image of the NC/NR composites.

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

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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

Cambridge Nanosystems

UNITED KINGDOM

Dr Anna Mieczakowski

Chief Operating Officer

Register to see this speaker

Cost-Effective, Green, One-Step Process For Producing Ultra-High-Quality Graphene

Room 5
Wednesday, 27 April 2016
17:10 - 17:35

Presentation Summary

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.

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 Belin, 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.

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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

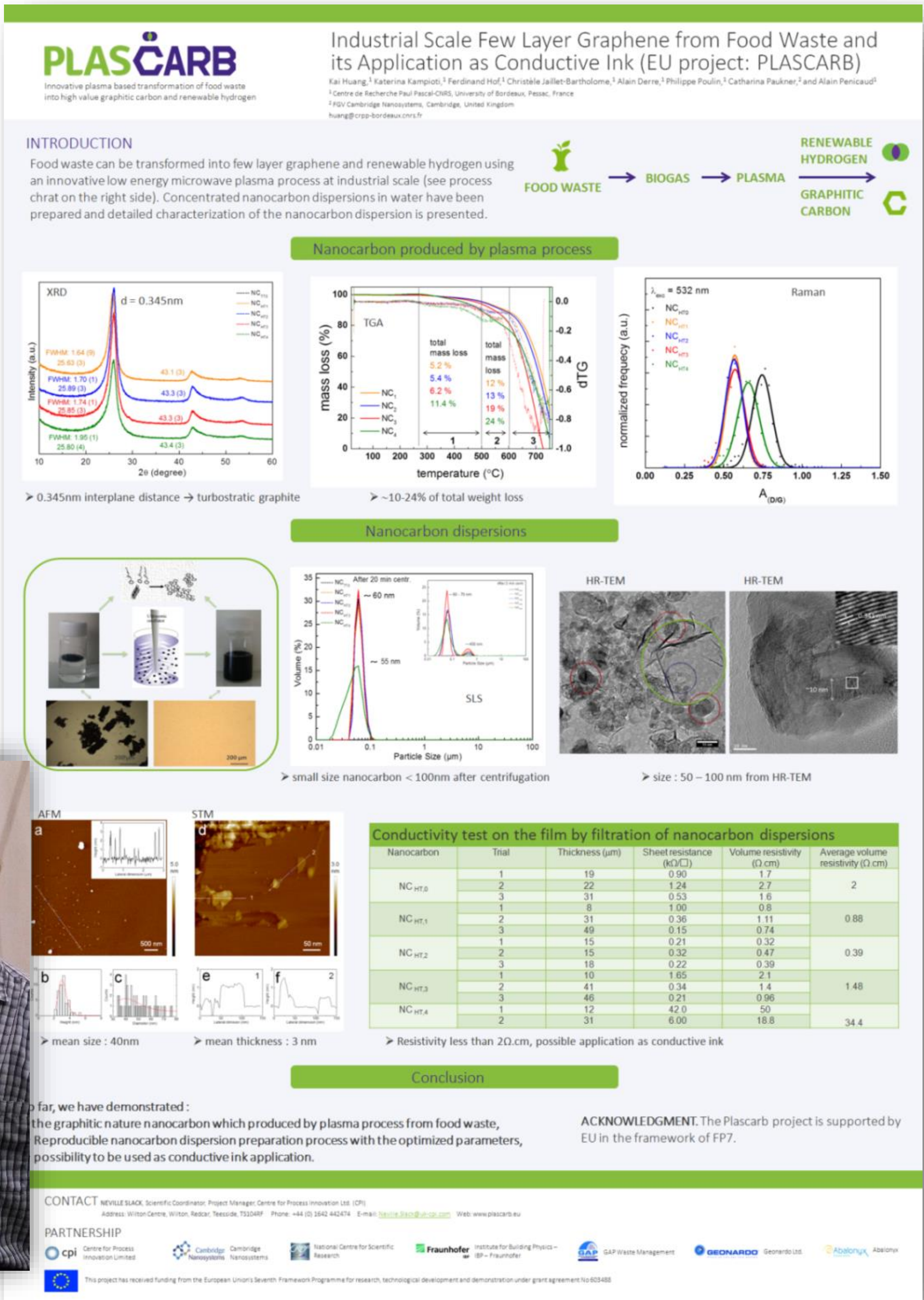
Posted by: Clean India Journal - Editor May 2, 2016 in Waste Management Comments Off

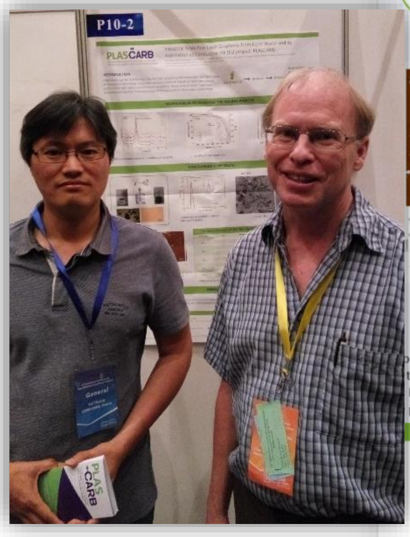
It may look like rubbish, but food waste does have its uses. It could even be converted into valuable graphite and hydrogen. An EU-funded project is setting out to do just that. The process being developed combines established Anaerobic Digestion (AD) with an innovative Microwave Plasma technology to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

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

2.19 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.





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. Kampioti/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.

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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 Brandstetter[1]; Florian Gehring[2]; Eva Knüpffer[2]; Stefan Albrecht[2]

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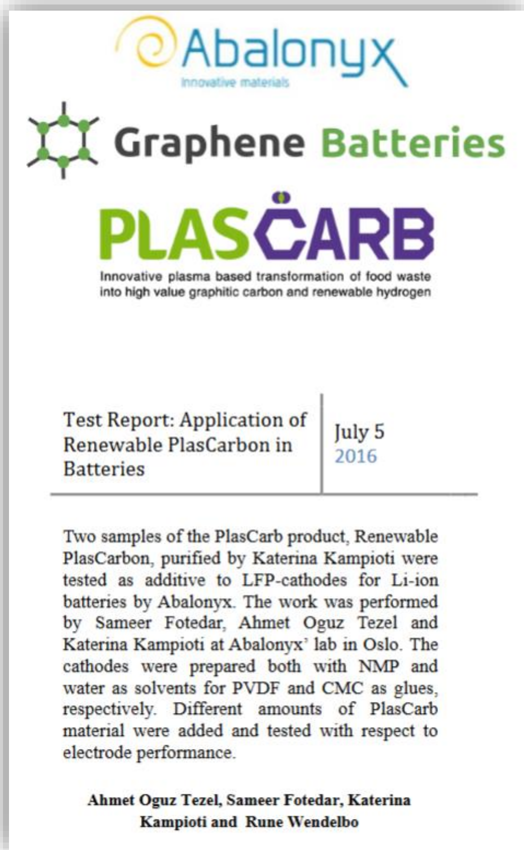
This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement No 603488

2.22 5 July 2016 – Abalonyx

A test report by Abalonyx on a common research venture of the PlasCarb partners CNRS CRPP and Alabonyx 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.

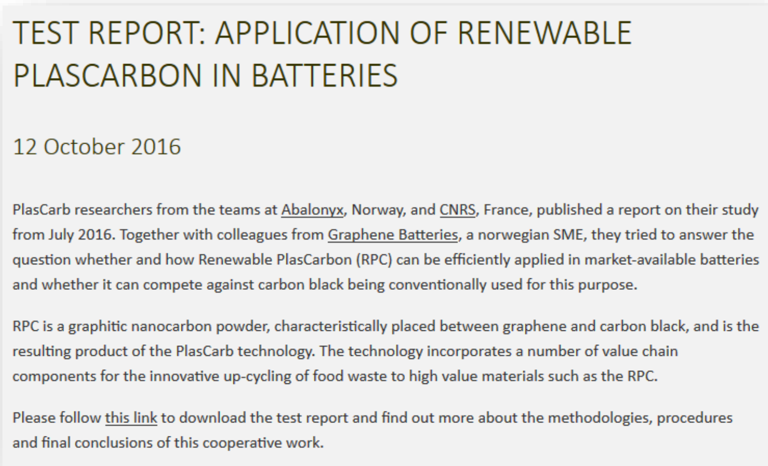

Abalonyx
Innovative materials
Graphene Batteries
PLASCARB
Innovative plasma based transformation of food waste into high value graphitic carbon and renewable hydrogen

Test Report: Application of Renewable PlasCarbon in Batteries

July 5 2016

Two samples of the PlasCarb product, Renewable PlasCarbon, purified by Katerina Kampioti were tested as additive to LFP-cathodes for Li-ion batteries by Abalonyx. The work was performed by Sameer Fotedar, Ahmet Oguz Tezel and Katerina Kampioti at Abalonyx' lab in Oslo. The cathodes were prepared both with NMP and water as solvents for PVDF and CMC as glues, respectively. Different amounts of PlasCarb material were added and tested with respect to electrode performance.

Ahmet Oguz Tezel, Sameer Fotedar, Katerina Kampioti and Rune Wendelbo


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.

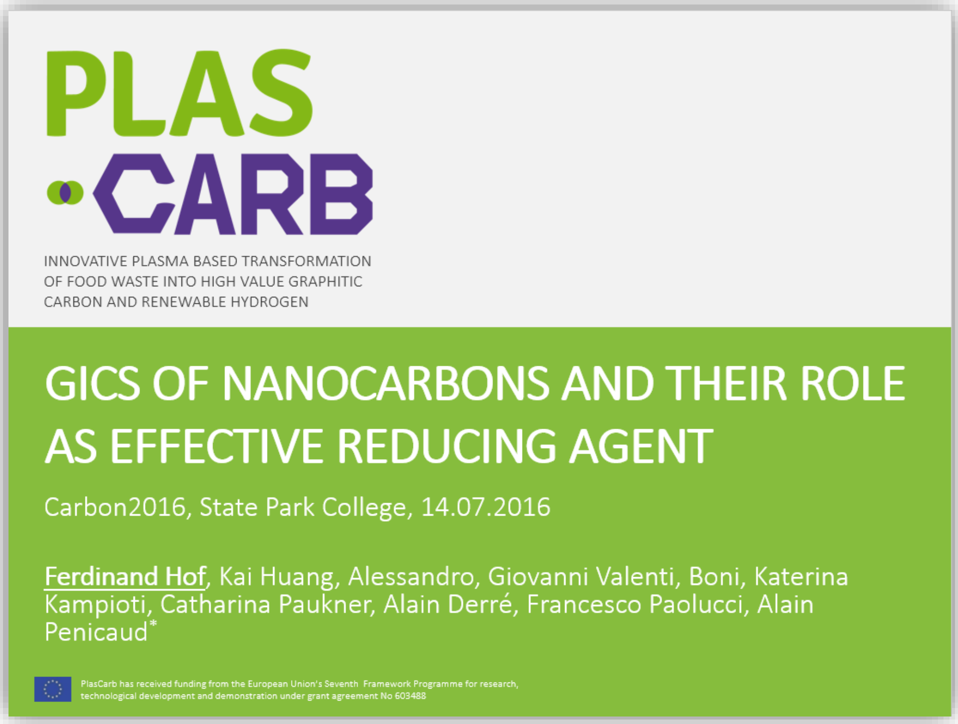
RPC is a graphitic nanocarbon powder, characteristically placed between graphene and carbon black, and is the resulting product of the PlasCarb technology. The technology incorporates a number of value chain components for the innovative up-cycling of food waste to high value materials such as the RPC.

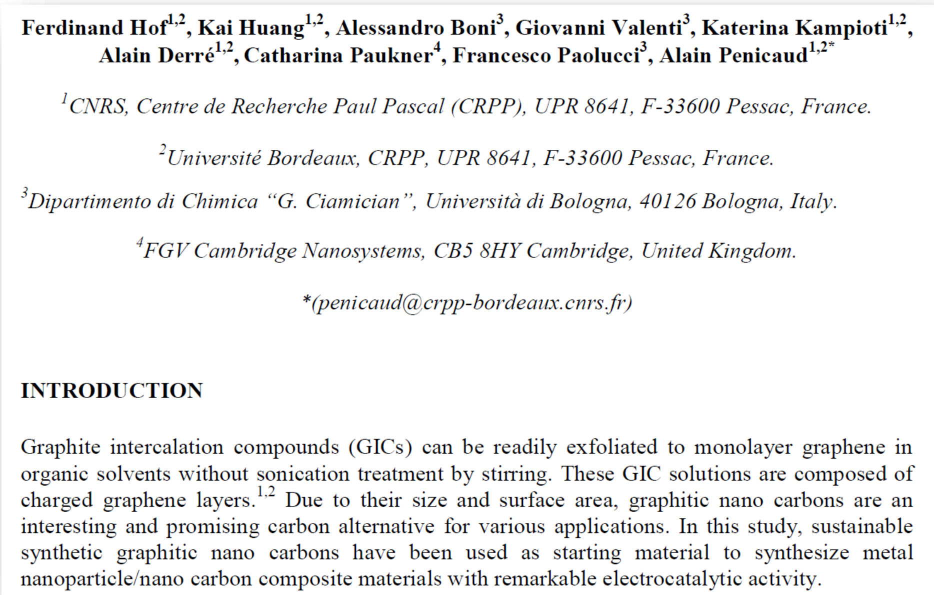
Please follow this link to download the test report and find out more about the methodologies, procedures and final conclusions of this cooperative work.

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

2.23 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.





Ferdinand Hof[1,2], Kai Huang[1,2], Alessandro Boni[3], Giovanni Valenti[3], Katerina Kampioti[1,2], Alain Derré[1,2], Catharina Paukner[4], Francesco Paolucci[3], Alain Penicaud[1,2*]

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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".

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

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

Charged Nanocarbons as Effective Reducing Agent in Nanoparticle Synthesis

Ferdinand Hof[1,2], Kai Huang[1,2], Alessandro Boni[3], Giovanni Valenti[3], Katerina Kampioti[1,2], Alain Derré[1,2], Catharina Paukner[4], Francesco Paolucci[3], 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

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2.25 10 August 2016 - CNS

PlasCarb's partner oganisation 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

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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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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.

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

2.27 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 Abalonyx Innovative materials

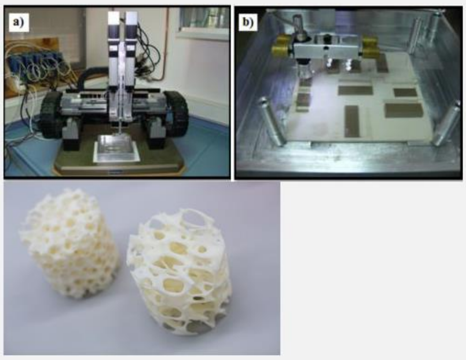
Advances in Bone Tissue Engineering with Renewable PlasCarbon

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.

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