The PlasCarb project will use innovative technology to produce EU identified critical and valuable products – graphitic carbon and renewable hydrogen – from food waste.

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The PlasCarb consortium is composed of eight partners from five European countries, whose complimentary expertise will enable the required results to be successfully delivered.

Partnership

- Centre for Process Innovation Limited - CPI
- GasPlas
- National Centre for Scientific Research - CNRS
- Institute for Building Physics - IBP - Fraunhofer
- Uvasol Ltd.
- GAP Waste Management
- Geonardo Ltd.
- Abalonyx

PLASCARB

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

Industry and research collaborating to combine Anaerobic Digestion (AD), Innovative low temperature microwave plasma processing and Sustainable Engineering using leading edge control of carbon morphology and purification techniques to produce 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

ABOUT PLASCARB

PlasCarb will transform biogas generated by Anaerobic Digestion (AD) 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. As part of the project the quality and economic value of the carbon and renewable hydrogen will be optimised using high quality research and industrial process engineering. Life cycle analysis will ensure that the approach is sustainable and taken beyond best available technology.

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 CO_2 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 (CH_4), Carbon Dioxide (CO_2) 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.

MICROWAVE PLASMA

Molecular cleavage using plasma is well known. This microwave plasma technology involves microwave induced plasma to energy efficiently cleave CH_4 into graphitic carbon and hydrogen, with no CO_2 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.

GRAPHITIC CARBON AND RENEWABLE HYDROGEN

The outputs from the PlasCarb project are graphite (graphitic carbon) and renewable hydrogen (RH_2). Both these are themselves valuable products. The EU has designated graphite as one of the EU's 14 economically critical raw materials and imported in substantial quantities into the EU27. It has been identified as of strategic importance in the development of future emerging technologies, ironically those needed for a low carbon economy. The global graphite market is forecast to grow at a CAGR of 5.52% over the period 2012-2016. One of the key factors contributing to this growth is the increasing use of graphite in batteries and use in the emerging technologies such as advanced electronics and fuel cells. The global market for graphite, either mined or synthetic is worth approximately €10 billion per annum.

Hydrogen is used in significant quantities by industry. Predicted global demand in 2016 is 286 million m^3. Hydrogen has also been identified as a future transport fuel for a low carbon economy (including use in the emerging Fuel Cell technology) and the ability to produce renewable hydrogen has added benefits as currently 95% of hydrogen is produced from fossil fuels, PlasCarb will generate RH_2, Renewable Hydrogen.

The PlasCarb project flexible, economic and financial models will be developed in order to facilitate additional investment funding for the widespread future market uptake within the EU.