Universidad de Valladolid

Departamento de Ingeniería Química y Tecnología del Medio Ambiente

AVAILABLE RESEARCH PROJECT TOPICS

Ref.	Title	Description	Director
040	HIGH TEMPERATURE THERMAL HYDROLYSIS TO ENHANCE ANAEROBIC BIODEGRADABILITY OF SLUDGE AND OTHER WASTES	Based on the increasing interest of promoting the use of organic wastes as a resource for green energy production, the optimization of the anaerobic digestion becomes a key issue. In order to overcome the limiting hydrolytic step, a thermal pre-treatment is proposed as a very attractive option, but sensitive to the formation of recalcitrant or inhibitory compounds at high temperatures. Therefore, the experimental aim is evaluating the influence of medium-high thermal pre-treatment and short time to the subsequent anaerobic digestion through biochemical methane potential (BMP) tests.	Sara Isabel Pérez Elvira sarape@iq.uva.es
~~039~~	~~STUDY OF THE THERMAL DEGRADATION OF OLIVE POLYPHENOLS~~	~~Polyphenols are bioactive compounds with antioxidant activity highly present in olive pomace, an industrial by-product greatly produced in our region. The further valorisation of this residue into high added products, such as a polyphenol extract, will ensure the sustainability of this industry.~~ ~~However, the extraction of polyphenols is not environmentally friendly and so, requires of intensification methods in order to enhance the process. Microwave technology is one of the most intensification technique used nowadays. Although it accelerates the extraction, microwaves also entail a temperature rise that may decay the quality of the final product.~~ ~~The proposed study aims to assess the thermal degradation of the polyphenols present both in the pomace and in the extract. Special attention will be given to oleocanthal, a polyphenol with highly appreciated pharmacological properties and thermal sensitivity.~~ ~~Research project aim to be started in July 2017.~~	~~Rafael MATO CHAÍN~~ ~~rbmato@iq.uva.es~~ ~~Ana ÁLVAREZ MARTÍN~~

038	PHOTOCATALYTIC DRY-REFORMING	The conversion of CO2 emissions into a source of fuels and materials is a promising option to obtain economic benefits while providing an environmental solution to the problem greenhouse gases emissions. By reacting CO2 and methane during dry-reforming two potent greenhouse gases could be converted into syngas. This reaction is highly endothermic (+247 kJ/mol) and consequently an environmentally beneficial process should be based on an abundant renewable energy source. More energy from the sun hits the earth in one hour than all the energy consumed on our entire planet in a year. Consequently, there is an enormous potential on this energy. The aim of this work is to develop a process that uses solar energy to carry out the dry-reforming reaction. For that both the photocatalytic material and the reactor will be designed and built. The work will be completed with a theoretical description of the process.	Ángel MARTÍN MARTÍNEZ mamaan@iq.uva.es Alexander NAVARRETE MUÑOZ anavarretem12@gmail.com Sergio MUÑOZ PALACIOS
037	BIOMETHANE FROM HIGH-PRESSURE ANAEROBIC DIGESTERS	The removal of CO2 from biogas, which increases its energetic content and allows transportation, requires of several units for upgrading by physical/chemical absorption or pressure-swing adsorption, the most employed technologies nowadays. The objective of this research is to alter CO2 gas-liquid equilibrium and exploit methanogenesis within anaerobic digesters by increasing working pressure and adding H2 in order to transform CO2 to CH4 by means of methanogenic archaeas. As a result, biomethane (CH4 concentration > 95%) is directly obtained in the anaerobic digester and the necessity of additional upgrading avoided. High pressure anaerobic digestion (HPAD) provokes a displacement in gas-liquid equilibrium so that the concentration of CO2 (high solubility)in the gas phase is reduced and CH4 (low solubility) concentration increased. Nevertheless, dissolved CO2 and carbonic acid equilibrium is also modified resulting in a lower pH that may cause anaerobic digestion breakdown. To overcome this limitation, H2 is added. HPAD facilitates H2 transfer to the liquid where it is employed by methanogenic archaeas to transform CO2 to CH4, thus avoiding reactor acidification and increasing CH4 production.	Fernando FDZ-POLANCO ffp@iq.uva.es María FDZ-POLANCO maria@iq.uva.es Israel DÍEZ VILLALOBOS Israel.diaz@iq.uva.es

036	MEMBRANE BIOREACTORS FOR CHEMOAUTHOTROPHIC BIOGAS UPGRADING	When upgrading biogas, only physical/chemical technologies (i.e.: absorption, adsorption and membranes) are employed at commercial scale despites the high operating costs and disposal problems of these alternatives. This project aims to develop a biological alternative that transforms CO2 to CH4, thus creating added value from CO2, while minimizing disposal problems. The process occurs in a bioreactor containing an adapted archaeal community to which biogas and H2 are added so that H2 and CO2 are transformed to CH4 by the action hydrogenotrophic archaeas. H2 utilization is an attractive possibility since it is being proposed as a source of energy accumulation from renewable energies (e.g. solar, wind) to equilibrate energy demand picks from consumers and excessive electricity generation during low-demand periods. However, actual technology cannot properly afford direct storage & use of H2. Then, H2 and CO2 transformation to CH4 creates a synergy between renewable sources, which increases energy conservation, and a better exploitation of existing infrastructures for CH4 transport and storage across Europe.	Fernando FDZ-POLANCO ffp@iq.uva.es
035	AGROINDUSTRIAL EFFLUENTS VALORIZATION THROUGH THE USE OF MICROALGAE TO OBTAIN BIO-PRODUCTS	This project aims to obtain bioproducts from microalgae biomass, through the recycling of nutrients from agrofood processing wastewater, for a more economical and environmentally sustainable process; integrating the production and valorization under the biorefinery concept, and determining the economic viability by the Life Cycle Analyses (LCA). Two different strategies about biomass uses are considered . First, the direct utilization of the whole biomass as feed in aquaculture, or in the production of biofertilizers or biogas. Second, the processing of the biomass to obtain different commodities of industrial interest. Because microalgae biomass is mainly composed of proteins, carbohydrates and lipids, the bio-products to be obtained are: 1) proteins to be used in animal nutrition through incorporation into feed, 2) alcohols that will be obtained from pre-treatment and fermentation of microalgae biomass, 3) oils from the lipid fraction that can be used to formulate feeds for animal uses, and 4) biogas that will be obtained from the anaerobic digestion of residual algal biomass..	Silvia BOLADO RODRÍGUEZ silvia@iq.uva.es

		Specifically, at this time, we propose two research projects, focusing in the production of bioenergy through two alternative of the algae biomass valorization: 1. The production of bioalcohols from the carbohydrate fraction of the microalgae biomass. 2. The production of biogas by pretreatment and anaerobic digestion of the whole biomass.	
034	ANAEROBIC TREATMENT OF DOMESTIC WASTEWATER AT PSYCHROPHILIC CONDITIONS	Study of the methanogenic activity of acclimated sludge and non acclimated sludge at psychrophilic conditions	M. Mar PEÑA MIRANDA pena@iq.uva.es
033	BIOREFINERY PROCESS IN IONIC LIQUIDS MEDIA	Ionic liquids are substances totally formed by ions that are liquid at room temperature. In the last decades they have been intensely studied as green solvents due to their special properties, mainly their non-volatility, high solvation power and capacity for stabilizing different catalysts including enzymes. In addition their properties can be tuned by appropriate modification of the cations and anions constituting the ionic liquid. Recently some ionic liquids have proved to be able to dissolve cellulose and other natural polymers in high concentrations. These natural polymers can be easily recovered just by addition of water. This cellulose solvation capacity opens the possibility of creating new efficient processes for biomass pre-treatment, hydrolysis and synthesis of cellulose derivatives. A major drawback of these processes is the high viscosity of ionic liquids and the solutions of natural polymers in ionic liquids. This drawback can be solved by adding co-solvents such as carbon dioxide. It is known that carbon dioxide can be dissolved in concentrations as high as 70% in mol at moderated pressure. In addition it is known that carbon dioxide is able to decrease viscosities and melting points of ionic liquids even at very low concentrations. The work will consist of studying biopolymer processing in ionic liquid media by determining the influence of different operation parameters:	María Dolores Bermejo Roda mdbermejo@iq.uva.es

		temperature, concentration, concentration of a co-solvent (pressure of CO2), different ionic liquids and correlation of kinetic data. In addition it will be necessary to separate the reactions products by crystallization from the reaction mixture and purification of final products. Special precipitation techniques such as PGSS of SAS processes using CO2 at high pressure may be used. Products will be analyzed by FT-IR. Other analytical techniques such as Karl Fischer Titration, HPLC etc can be used in some moments. It may be required to perform some phase equilibrium measurements with a high pressure visual cell or density/viscosity measurements in a vibrating tube apparatus in order to determine some properties of the reacting mixture.	
032	HYDROTHERMAL RECYCLING OF CO2: DEVELOPMENT OF NOVEL AEROGEL CATALYSTS	The development of methods for the abatement of CO2 emissions is an urgent task. As a complement for capture and storage technologies that consider CO2 as a residue, utilisation of technologies that consider CO2 as a resource have the advantage of generating an added value, but their development still is in an early stage. Among the different carbon dioxide conversion technologies proposed, the hydrothermal reduction of CO2 has shown the potential to selectively convert carbon dioxide into valuable products such as formic acid, methane and methanol, favoured by the increased reactivity of CO2 in hydrothermal conditions. However, current research on this technology is limited to discontinuous or semicontinuous process layouts that show limitations for practical applications in terms of productivity, equipment durability and energy efficiency. For a scalable, cost-effective deployment of this technology, a fully continuous reactor design is required, but to accomplish this goal several challenging scientific and technical questions must be solved, including: controlling reaction conditions for the selective generation of the desired products; incorporating the catalyst regeneration cycle in the process; and integrating the hydrothermal reduction reaction with CO2-production process. The objective of this research project is the development of a continuous process for the hydrothermal reduction of CO2.	María Dolores Bermejo Roda mdbermejo@iq.uva.es Ángel Martín Martínez mamaan@iq.uva.es

		To do so innovative catalyst designs based on zinc aerogel-supported metal nanoparticles of reductants (Fe, Zn) and catalysts (Cu, Ni) will be tested, with the objective of achieving a high catalytic efficiency as a well as a high stability of the catalyst. Aerogels are extremely light porous materials (density 0.25 g/cm3 – 0.003 g/cm3) with a very high porosity (0-92 – 0.98) and specific area (400 m2/g – 1500 m2/g)3. Aerogels are produced by drying of organic gels with supercritical fluids (e.g. supercritical CO2). The work will consist of the synthesis of these catalyst and in evaluating its performance as well as the kinetics of key reaction steps operating at hydrothermal conditions (T>300ºC) at temperatures, pressures, pH and residence times to determine the production of different organics (formic acid, methanol etc.) from carbon dioxide. The conversion and determination of these compounds will be tested by Total Organic Carbon Analysis and Gas Cromatography. It may be necessary to correlate the data to obtain kinetic parameters.	
030	ESTUDIO DE LA GENERACIÓN DE INHIBIDORES DE LA FERMENTACIÓN DURANTE EL PRETRATAMIENTO DE MATERIAL LIGNOCELULÓSICO	Lignocellulosic residues are a promising, renewable and sustainable raw material for biofuel production. They are abundant, have a low cost and their valorisation often entails the mitigation of an environmental problem, by accumulation and natural degradation. The use of lignocellulosic materials for biofuels production requires three steps in most of cases: pretreatment for opening the biomass structure, enzymatic hydrolysis to convert the carbohydrates polymers into monomeric fermentable sugars and the bioconversion of the hydrolysates obtained in alcohols like ethanol and butanol by alcoholic fermentation, or methane by anaerobic digestion. This project, applying the biorefinery concept, proposes a complete valorization of a very abundant lignocellulosic waste, sugarcane bagasse, with the integration of alcohols (butanol or ethanol) and methane production processes. The results are analyzed comprehensively considering the technical, economic and environmental feasibility of each process, applying LCA tools. In this way, this research work focuses on the study of the different sequential stages and their interrelation, essaying the effect of different pretreatments (ozonolysis, steam explosion, thermal and	Silvia BOLADO RODRÍGUEZ silvia@iq.uva.es

		thermochemical) in sugar solubilization and inhibitory compounds generation.	
029	ELIMINACIÓN ANAEROBIA DE COMPUESTOS ORGÁNICOS VOLÁTILES PROVENIENTES DE LA INDUSTRIA PETROLÍFERA: EFECTO DEL OXÍGENO DISUELTO A BAJAS CONCENTRACIONES	Se estudiará la eliminación biológica de compuestos orgánicos volátiles (COVs) provenientes de la industria petrolífera de forma anaerobia. Se utilizarán microorganismos desnitrificantes y se estudiará el efecto del oxígeno disuelto a bajas concentraciones en el desempeño global del proceso. Los experimentos se realizarán en un biofiltro percolador y se analizarán sustratos y productos en fase gaseosa y fase líquida. El proyecto incluye una carga importante de trabajo analítico y experimental y no requiere amplios conocimientos de ingeniería o de microbiología.	Guillermo QUIJANO GOVANTES gquijano@iq.uva.es Raúl Muñoz mutora@iq.uva.es
028	CARACTERIZACIÓN DE LA HIDRÓLISIS TÉRMICA DE LODOS	Partiendo de lodos frescos y tratados en nuestras plantas piloto realizar la comparativa tomando como referencia: análisis químicos convencionales completos (DQO, N, P, SST, SSV, AGV.....) análisis físicos específicos (deshidratabilidad, centrifugabilididad, viscosidad,..), análisis microbiológicos (patógenos).	Sara I. PEREZ ELVIRA sarape@iq.uva.es
027	APROVECHAMIENTO DE RESIDUOS Y EFLUENTES DE LA INDUSTRIA AGROALIMENTARIA EN LA PRODUCCIÓN DE PROTEÍNA UNICELULAR (SCP)	El objetivo del trabajo es proponer una alternativa que permita reducir el impacto ambiental negativo ocasionado por los residuos y/o efluentes generados en las industrias agroalimentarias mediante su utilización en la producción de microalgas lo que conduciría a la obtención de un producto de alto valor nutricional como es la proteína unicelular de uso en acuicultura. Se plantea por lo tanto, la producción de SCP a partir del microalga Spirulina maxima utilizando medios de crecimiento que incorporen residuos y/o efluentes de la industria agroalimentaria, en concreto dióxido de carbono procedente de los gases de combustión de calderas como fuente de carbono inorgánico y aguas condensadas u otras corrientes residuales del proceso azucarero como fuente de nutrientes. El trabajo implica el aprendizaje de técnicas microbiológicas sobre el mantenimiento de microorganismos y preparación de inóculos y la caracterización del producto obtenido utilizando las técnicas analíticas apropiadas. Se realizarán ensayos de crecimiento en discontinuo y se operará en fotobiorreactores cerrados.	Mónica COCA SANZ monica@iq.uva.es Gerardo GONZÁLEZ BENITO gerardo@iq.uva.es
026	FERMENTACIÓN CONTINUA DE	El objetivo del trabajo es el estudio de diferentes estrategias de fermentación continua de hidrolizados de biomasa lignocelulósica, con el fin de maximizar	María Teresa GARCÍA CUBERO

	HIDROLIZADOS DE BIOMASA	el rendimiento de fermentación. Se proponen ensayos con P. stipitis en uno o dos reactores de tanque agitado, modificando las principales variables de proceso. Para el seguimiento analítico del proceso, se emplearán técnicas de cromatografía (consumo de azúcares y formación de solventes) y espectrofotométricas (densidad óptica, concentración de microorganismos).	maite@iq.uva.es Gerardo GONZÁLEZ BENITO gerardo@iq.uva.es
025	FERMENTACIÓN ABE: OPERACIÓN EN BATCH	El trabajo tiene por objetivo maximizar la concentración de solventes (butanol) obtenidos de la fermentación de melaza con Clostridium sp. Se plantean ensayos de fermentación en discontinuo con distintas cepas de microorganismos, modificando las principales variables de operación: pH, concentración de sustrato, etc. El trabajo implica asimismo el aprendizaje de técnicas de cultivo, mantenimiento y fermentación de microorganismos estrictamente anaerobios. El seguimiento analítico del proceso de fermentación se llevará a cabo mediante cromatografía de líquidos y cromatografía de gases. Se seguirá asimismo la concentración de intermedios de fermentación, crecimiento microbiano, etc.	Gerardo GONZÁLEZ BENITO gerardo@iq.uva.es María Teresa GARCÍA CUBERO maite@iq.uva.es
024	OBTENCIÓN DE BIODIESEL MEDIANTE CATÁLISIS HETEROGÉNEA	El objetivo del trabajo es determinar el tipo de catalizador heterogéneo y las condiciones de operación que permitan optimizar la producción de biodiesel a partir de la reacción de transesterificación de aceites vegetales con metanol. Se plantean ensayos con distintos óxidos, principalmente óxido de calcio, magnesio y aluminio, así como mezclas de los mismos. En una primera parte del trabajo se aprenderán las técnicas de preparación y activación de catalizadores. En segundo término se llevarán a cabo ensayos de obtención de biodiesel con los distintos catalizadores. Se comparará el resultado de la reacción con el obtenido del proceso estándar de producción con catalizador homogéneo. El seguimiento analítico del proceso se llevará a cabo mediante cromatografía de gases. Para la caracterización de los diferentes catalizadores se llevarán a cabo ensayos de termogravimetría, Rayos X, etc…	Susana LUCAS YAGÜE susana@iq.uva.es Gerardo GONZÁLEZ BENITO gerardo@iq.uva.es
023	SEPARATION OF SOLVENTS FROM ABE FERMENTATION PROCESS	El trabajo tiene por objetivo la puesta en marcha de un proceso de separación de los solventes obtenidos en el proceso de fermentación ABE mediante el empleo de membranas. Se propone la separación mediante preevaporación. El alumno deberá poner en marcha la instalación de preevaporación y estudiar la influencia de los distintos parámetros de operación en el rendimiento de separación en primer lugar con mezclas puras y en una segunda etapa del proceso con caldos de fermentación. En	Gerardo GONZÁLEZ BENITO gerardo@iq.uva.es María Teresa GARCÍA CUBERO maite@iq.uva.es

		este punto es crítico el ensuciamiento de las membranas y, por tanto, la etapa de lavado/regeneración de las mismas. Para el seguimiento analítico del proceso se emplearán técnicas de HPLC y GC.	
022	OPTIMIZATION OF ENZYMATIC HYDROLYSIS OF PRETREATED WHEAT STRAW	El objetivo del trabajo es determinar las condiciones óptimas de las etapas de pretratamiento e hidrólisis enzimática de paja de trigo que proporcionan el mayor rendimiento en azúcares simples potencialmente fermentables a etanol. Se planteará un diseño de experimentos complejo en el que se tengan en cuenta las principales variables de operación tanto de la etapa de pretratamiento como de la hidrólisis enzimática. Se plantearán diferentes técnicas de diseño estadístico de experimentos (superficie de respuesta, CCD, etc.) con el objetivo de determinar el tipo de estudio que proporcione la mayor información con el menor número de ensayos. En una segunda etapa, se llevará a cabo la experimentación en laboratorio. Los resultados de los ensayos se tratarán de forma estadística mediante Statgraphics. Como objetivo último se plantea el ajuste de los resultados a un modelo matemático que permita predecir la concentración de azúcares totales fermentables en función de los valores que tomen los parámetros de operación.	Susana LUCAS YAGÜE susana@iq.uva.es María Teresa GARCÍA CUBERO maite@iq.uva.es
021	EVALUACIÓN DE LA ECOTOXICIDAD DE COMPUESTOS ACTIVOS FARMACÉUTICOS Y DE HIGIENE PERSONAL (PPCPS) EN UN PROCESO DE AERACIÓN EXTENDIDA.	El investigador realizará el montaje y puesta a punto de un reactor de Aeración Extendida a nivel de laboratorio y según parámetros de funcionamiento de un proceso similar a escala industrial. Al alcanzar condiciones estacionarias y utilizando agua residual sintética con presencia de compuesto activos farmacéuticos y de higiene personal, se evaluará la ecotoxicidad del influente y efluente mediante ensayos de bioluminiscencia y respirometría, con el fin de analizar el efecto de este tratamiento sobre la calidad toxicológica del agua tratada.	Rubén IRUSTA MATA rubiru@eii.uva.es Pedro GARCÍA ENCINA pedro@iq.uva.es Sheyla ORTIZ DE GARCÍA
020	EVALUACIÓN DE LA ECOTOXICIDAD DE COMPUESTOS ACTIVOS FARMACÉUTICOS Y DE HIGIENE PERSONAL (PPCPS) EN UN BIORREACTOR DE MEMBRANA.	El investigador realizará el montaje y puesta a punto de un Biorreactor de membrana a nivel de laboratorio y según parámetros de funcionamiento de un proceso similar a escala industrial. Al alcanzar condiciones estacionarias y utilizando agua residual sintética con presencia de compuesto activos farmacéuticos y de higiene personal, se evaluará la ecotoxicidad del influente y efluente mediante ensayos de bioluminiscencia y respirometría, con el fin de analizar el efecto de este tratamiento sobre la calidad toxicológica del agua tratada.	Rubén IRUSTA MATA rubiru@eii.uva.es Pedro GARCÍA ENCINA pedro@iq.uva.es Sheyla ORTIZ DE GARCÍA

018	STABILIZATION OF HYDROGEN STORAGE MATERIALS IN LIGHT FUNCTIONALIZED NANO-POROUS SUPPORTS	Currently there is a considerable interest in the development of fuel cells of hydrogen for transportation applications. For the application of this technology, several technical issues must be solved, among them the development of an efficient hydrogen storage method. The objective of this work is to develop a new solid state hydrogen storage material based on hydrides which, by reduction of particle size to the sub-micrometric range and stabilization of the particles in a support, can improve the kinetics and reversibility of hydrogen storage and release processes. For this purpose, silica aerogels will be synthesized in form of sub-millimetric/micrometric particles, and a magnesium hydride precursor will be impregnated in the aerogel using supercritical carbon dioxide as carrier gas. The kinetics of hydrogen release as well as the evolution of the material during application will be tested.	Ángel MARTÍN MARTÍNEZ mamaan@iq.uva.es
017	DEVELOPMENT OF NOVEL NANOCARRIERS FOR DRUG DELIVERY BY EMULSION + DENSE GAS TECHNIQUES	The use of nanocarriers can significantly improve the effectiveness and selectivity of active pharmaceutical compounds. In particular, water-insoluble components can be stabilized in an aqueous environment in the inner core of a micelle, thus increasing their bioavailability. The research work will consist in the preparation of micelle formulations using a natural antioxidant extracted from wine as active compound and Pluronic polymers as carrier materials. The aim of the research will be to determine the maximum amount of active compound that can be encapsulated in the micelles, as well as the stability of the formulations. Micelles will be characterized according to their size and size distribution, determined by dynamic light scattering (DLS) and microscopy, stability of formulations by analysis of the evolution of micelle size with time, residual organic solvent concentration determined by gas chromatography, and encapsulation efficiency determined by spectroscopy	Ángel MARTÍN MARTÍNEZ mamaan@iq.uva.es Soraya RODRÍGUEZ ROJO sorayarr@iq.uva.es
016	STABILIZATION OF HYDROGEN STORING HYDRIDES IN IONIC LIQUIDS	Hydrides are promising candidates as hydrogen storage materials due to their storage capacity, but they are limited by the kinetics of decomposition and release of hydrogen. These kinetics can be considerably increased by using a dissolution of the hydride instead of pure solid particles, transforming the solid-gas decomposition reaction of the hydride into a homogeneous phase reaction with lower mass transfer limitations. Ionic liquids are particularly suitable solvents for this purpose, since they show a negligible vapor pressure, and therefore they do not evaporate to the hydrogen gas phase.	María Dolores BERMEJO RODA mdbermejo@gmail.com Ángel MARTÍN MARTÍNEZ mamaan@iq.uva.es

		The research work will consist in the study of different hydride - ionic liquid pairs, testing the dissolution behavior of the hydride into the ionic liquid, as well as the kinetics of hydrogen production from the dissolutions.	
015	THERMODYNAMIC MODELLING OF POLYMER - SUPERCRITICAL FLUID SYSTEMS	The behavior of polymers in supercritical fluid environments is important for many applications such as polymer processing, drug encapsulation, etc. This work will study the modelling of the solid-liquid-gas behavior of polymer - supercritical CO2 mixtures, using novel equations of state to describe the solid phase.	Ángel MARTÍN MARTÍNEZ mamaan@iq.uva.es
013	ENCAPSULATION OF ACTIVE COMPOUNDS IN Beta-GLUCAN MICROPARTICLES	B-glucans are a diverse group of D-glucose polysaccharides, linked by beta type glycosidic bonds, that can vary with respect to molecular weight (MW), water solubility, viscosity, and three-dimensional configuration (linear or branched glucose chains). The most simple is the cellulose, a linear chain of glucose joined at the (1,4) position. However, the most interesting beta-glucans are those that have branching glucose side-chains attached to other positions that of the 3 and 6 position of the D-glucose rings. In addition, these side-chains can be attached to other types of molecules, like proteins. [1] Recently, they have receive lot of attention due to the health claims approved by the FDA (United States Federal Drug Administration) and the EFSA (European Food Safe Authority) related to the role of soluble (1,4)(1,3) -glucans present in cereal grains (oat, barley, rye) in the maintenance of normal blood cholesterol concentrations. Moreover, b-D-(1,3)(1,6)-linked glucans (from mushrooms, yeast walls or fungi) have the ability of enhancing and stimulating the immune system of humans and are thus called biological response modifiers (BRMs). Therefore, b-glucan microparticles can be used in targeting delivery of active compounds, i.e. antiobiotics, to increase cellular uptake by cells bearing glucan receptors such as macrophages and dendritic cells [2].	Soraya RODRÍGUEZ ROJO sorayarr@iq.uva.es Marta SALGADO

		The aim of this research project will be to determine the maximum amount of active compound that can be encapsulated of b-glucan using dense gas techniques, such supercritical antisolvent. The effect of b-glucan structure and MW in encapsulation efficiency will be studied. Besides, other parameters such as particle size and residual organic solvent concentration will be controlled. [1] Y.-T. Kim, E.-H. Kim, C. Cheong, D.L. Williams, C-W. Kim, S-T. Lim. Structural characterization of b-D-(1,3) (1,6)-linked glucans using NMR spectroscopy, Carbohydrate Research 328 (2000) 331–341 [2] E. Soto, Y. S. Kim, J. Lee, H. Kornfeld and G. Ostroff, Glucan Particle Encapsulated Rifampicin for Targeted Delivery to Macrophages, Polymers 2 (2010) 681-689	
012	Selection and characterization of CH4 and N2O-degrading microbial communities	A mixture of different sludge will be used as inoculum source for the enrichment of CH_4-degrading and N_2O-degrading microorganisms. The target specialized microbial communities will be enriched under batch and continuous gas-phase operation systems designed to promote suspended or attached growth. Increasing concentrations of O_2 in the gas phase and different e^- donor (acetate or methanol when applied) will be used for microbial enrichment purposes. The influence of pollutant concentrations will be also checked. The macroscopic performance of the enrichment systems in terms of biomass growth, CH_4/N_2O removal and CO_2/N_2 production will be monitored by OD, GC-FID (CH_4), GC-ECD (N_2O) and GC-TCD (CO_2/N_2). The identification of the communities will be conducted by molecular analyses as DGGE or RT-PCR. Kinetics parameters for the CH_4/N_2O biodegradation (μ_{max} and K_s) will be determined in the enrichment cultures.	Pedro GARCÍA ENCINA pedro@iq.uva.es Raúl Muñoz mutora@iq.uva.es
011	A novel process to the joint treatment of	Nowadays domestic solid waste is evacuated using containers and trucks while wastewater is evacuated through sewer networks. In this proposal	Fernando FDZ-POLANCO

	domestic garbage and waste water	garbage is mixed with wastewater using grinders or garbage disposers, thereby WWTP receives all the organic matter generated in households that can be transformed into biogas. The experimental aim is following the time evolution of the matter that is solubilized when travelling through the sewer system. Mass and energy balances will assess the positive increase in biogas production and the negative cost increase in wastewater treatment.	ffp@iq.uva.es
010	Bioproducts Production from agro-food residues using the Biorefinery Concept	The use of biorefinery concept for fractioning and biotransformation of agro-food residues is a useful alternative for its integral valorisation. The project goals to obtain two chemical building blocks, as succinic acid and malic acid, by fermentation of agro-food residues with specific microorganisms. Firstly, batch experiments will be carried out in order to establish the influence of the main operating conditions will be including tolerance to the substrate, influence of inhibitors, etc. Moreover, fed-batch experiments will be planned in order to increase both productivity and yield.	María Teresa GARCÍA CUBERO maite@iq.uva.es Gerardo GONZÁLEZ BENITO gerardo@iq.uva.es
009	Alternative electron donors in denitrification process	The objective of the project is to study the possibility of using alternative electron donors as methane or sulphide for denitrification of the effluent of an anaerobic membrane bioreactor treating domestic wastewater.	María Fdz-Polanco maria@iq.uva.es
008	Assessment of anaerobic digestion performance and inhibition based on the relative substrate composition	Methane yield, inhibition issues and co-digestion opportunities is directly related to the relative composition of the substrate (proteins, fats and carbohydrates). However, this point of view is not normally considered when evaluating the anaerobic biodegradability of organic wastes. The experimental approach proped is to characterize different substrates and correlate the results of biochemical methane potential (BMP) tests to the relative composition of them.	María Fdz-Polanco maria@iq.uva.es Sara Isabel Pérez Elvira sarape@iq.uva.es
~~007~~	~~Low temperature thermal hydrolysis to enhance anaerobic biodegradability of wastes~~	~~Based on the increasing interest of promoting the use of organic wastes as a resource for green energy production, the optimization of the anaerobic digestion becomes a key issue. In order to overcome the limiting hydrolytic step, a thermal pre-treatment is proposed as a very attractive option, but sensitive to the formation of recalcitrant or inhibitory compounds at high temperatures. Therefore, the experimental aim is evaluating the influence of~~	~~Sara Isabel Pérez Elvira~~ ~~sarape@iq.uva.es~~

		~~low-medium thermal pre-treatment to subsequent anaerobic digestion through biochemical methane potential (BMP) tests.~~	
006	Cultivation of microalgae as feedstock for biofuels production	The production of bioethanol from microalgae may play an important role to decrease dependence on fossil fuels and greenhouse gas emissions. This work aims to produce microalgal biomass using effluents from agro-food industries. The specific objectives are the reduction of nutrients in effluents (ammonia, nitrate and phosphate), the capture of carbon dioxide and the production of valuable biomass. Microalgae will be cultivated in tubular and open bioreactors. The influence of operating conditions on carbohydrate content will be evaluated. Then, different physical, chemical and enzymatic pre-treatments will performed to break down long carbohydrates into simple sugars, as a preliminary step on the production of bioethanol. Fermentation will be carried out with suitable microorganism able to ferment monosaccharides in hydrolysates.	Mónica COCA SANZ monica@iq.uva.es Gerardo GONZÁLEZ BENITO gerardo@iq.uva.es
005	Anaerobic membrane bioreactor (AnMBR) for the treatment of urban wastewater. Determination of the specific cake resistance	The main advantage of membrane technology is the possibility of decoupling the hydraulic retention time (HRT) and the sludge retention time (SRT). This can be achieved because the membrane works as a barrier, keeping the solids inside the reactor. No decanter is required and the concentration of solids in the bulk can be higher. More solids inside the reactor imply the possibility of working at higher organic loading rates with the consequent reduction of space. A higher SRT is also an advantage since it allows slow growing rate bacteria to developed, improving the efficiency. However, AnMBR have some disadvantages, mainly the fouling of the membrane. Fouling refers to the biomass and mineral salts that get stuck on the membrane surface; and clogging refers to the internal obstruction of the membrane pores. The fouling and clogging can be classified as reversible and irreversible; the first one is easily removed by regular backwashing with water and the second one needs more intensive cleaning with addition of chemical products.	M. Mar PEÑA MIRANDA pena@iq.uva.es
004	Increasing the sustainability of atmospheric pollution control technologies	Biotrickling filters (BTFs) are biological reactors where microorganisms grow attached to a packing material with a liquid solution continuously trickling over them. BTFs have been proven to be cost-effective and environmentally friendly technologies to treat malodorous emissions, particularly in wastewater treatment plants. However, this technology still presents high water and nutrient consumption	Raúl MUÑOZ TORRE mutora@iq.uva.es Raquel LEBRERO FERNANDEZ

		as important drawbacks. The goal of this project will be to assess the feasibility of the operation of biotrickling filters for odour abatement using wastewater and / or secondary effluents as liquid phase. This strategy will minimize or even completely eliminate the needs of fresh water and additional nutrients supply to the reactor, increasing its sustainability and reducing the operating costs by up to 70%.	raquelebrero.0503@gmail.com
003	Photo-active Biotrickling Filter: a proof of concept	Biotrickling filters (BTFs) are biological reactors where microorganisms grow attached to a packing material with a liquid solution continuously trickling over them. They are usually employed to treat gas-phase pollutants such as volatile organic compounds (VOCs), greenhouse gases or other industrial emissions. However, one of their limitations is the poor solubility of O2 in the water trickling over the packed bed, which can lead to oxygen limitations and reduced BTF performance, especially at high loading rates of water soluble gas pollutants. This innovative approach (never been tested before) proposes the possibility of supplying oxygen directly to the liquid phase by means of photosynthetic organisms (microalgae) growing in the bioreactor and exploring the effects of light in the biodegradation of atmospheric pollutants such as H2S or VOCs.	Raúl MUÑOZ TORRE mutora@iq.uva.es Raquel LEBRERO FERNANDEZ raquelebrero.0503@gmail.com
002	Improving sustainability in the petrochemical industry by gas emission treatment in microalgae photobioreactors	Atmospheric pollution due to volatile organic compound (VOC) emission from the petrochemical industry is nowadays one of the most important environmental problems, with severe negative effects on the environment and human health. Biological technologies for gas treatment are usually preferred over physical-chemical treatment methods due to their lower costs and environmental-friendliness. However, the treatment of VOC laden petrochemical emissions in bioreactors is usually limited by their low mass transfer from the gas to the aqueous phase and the absence of O2 in most of these emission, which entails the accumulation of the contaminant to toxic concentrations for the bacterial community. In this sense, photosynthetic oxygenation is proposed as a feasible solution since microalgae are capable of supplying with the necessary oxygen to the aerobic bacteria responsible for VOC biodegradation, and at the same time using the carbon dioxide released by the bacterial community. The objective of this work will be to investigate the potential of the symbiosis between microalgae and bacteria to degrade high concentrations of VOCs typically found in petrochemical emissions. For this purpose, different bioreactor configurations will be tested and optimized for a better system performance.	Raúl MUÑOZ TORRE mutora@iq.uva.es Raquel LEBRERO FERNANDEZ raquelebrero.0503@gmail.com
001	Membrane bioreactors for gas treatment:	Odorous compounds have become in recent years one of the main causes of environmental public complaints worldwide. Moreover, it has been recently	Raúl MUÑOZ TORRE

	overcoming mass transfer limitations in two-phase systems	demonstrated that these emissions are responsible for human health problems such as nausea, headaches, respiratory difficulties, etc. Odorous emissions are difficult to treat since they contain many different compounds with different solubilities. While biological techniques are reliable systems for odour treatment, they usually offer low removal efficiencies for the more hydrophobic compounds (such as alpha-pinene or hexane), and require large areas for their installation. In this work, the performance of a hybrid technology composed by two innovative technologies to overcome these problems will be assessed: 1. Membrane bioreactors, compact technologies with high contact area in a reduced reactor volume, and 2. Two-phase bioreactors, where an organic, non-aqueous phase (such as silicone oil) is added to improve mass transfer of the hydrophobic odorants. An innovative two-step system (hollow-fiber membrane bioreactor + two-phase hollow-fiber membrane bioreactor) will be applied for a complete removal of the odorants present in the synthetic emission.	mutora@iq.uva.es Raquel LEBRERO FERNANDEZ raquelebrero.0503@gmail.com