



# Advanced sustainable materials derived from the valorization of agri-food and industrial waste, creating value and new business models based on the circular economy.

## Recovery of industrial waste in a sustainable and profitable way

We assist our clients in finding new business opportunities through recycling and valorization of materials and waste using processes like hydrothermal carbonization (HTC) assisted with microwaves, pyrolysis, and other proprietary know-how processes.



## ...and the creation of state-of-the-art materials for technology companies.

Materials engineering enhances product performance through changes or modifications to the material. We create composite biomaterials and biocomposites using biobased polymers, biographene, natural fibers, etc. We impart various properties to these composite biomaterials such as strength, conductivity, thermal stability, sensitivity to stimuli, hydro-thermo-photochromism, photoluminescence, etc.

HTC asistida con radiación microwave

- biocarbonos
- biografeno
- biofibras
- bioresinas
- nuevos biopoliméros

ESTRUCTURAS DE CARBONO	Aplicaciones		BIOPLASTICOS		
	ESTRUCTURAS DE CARBONO	BIOPLASTICOS	CARGAS/ ADITIVOS	PROPIEDADES	
<ul style="list-style-type: none"> <li>Carbón activado</li> <li>Nanodots</li> <li>Nanoesferas</li> <li>Nano y microfibras</li> <li>Nanorods</li> <li>Nanotubo</li> </ul>	<ul style="list-style-type: none"> <li>Bioimagen</li> <li>Fotocatalisis</li> <li>Sensores</li> <li>Supercondensadores</li> <li>LED's</li> <li>Placas solares</li> </ul>	<ul style="list-style-type: none"> <li>Portador de fármacos</li> <li>Purificación</li> <li>Envases</li> </ul>	<ul style="list-style-type: none"> <li>Poliuretano</li> <li>Poliéster</li> <li>Policarbonato</li> <li>Acido Poliláctico (PLA)</li> <li>Polihidroxialcanoatos (PHA's)</li> <li>Resinas Vinilica, Epoxi y Acrilica</li> </ul>	<ul style="list-style-type: none"> <li>Mecánicas</li> <li>Térmicas y Mecánicas</li> <li>Resistencia térmica e Impacto</li> <li>Difusión de gases</li> <li>Biocompatibilidad</li> <li>Térmicas, mecánicas, químicas, degradación</li> </ul>	
<ul style="list-style-type: none"> <li>Calidad media/alta: biochar-hidrochar</li> <li>Calidad High-Tech biometano &amp; CVD</li> </ul>	<ul style="list-style-type: none"> <li>Portador de genes y fármacos</li> <li>Terapias anticancer</li> <li>Implantes</li> <li>Bioimagen/ Biodetección</li> </ul>	<ul style="list-style-type: none"> <li>Energía</li> <li>Diagnóstico</li> <li>Tintas</li> <li>Materiales</li> </ul>			
<ul style="list-style-type: none"> <li>Fibra Celulosa</li> <li>Microfibras de celulosa superhidrofóbicas</li> <li>Nanocristales de celulosa funcionales</li> </ul>	<ul style="list-style-type: none"> <li>Materiales</li> <li>Textiles</li> <li>Adhesivos/sellantes</li> <li>Portador de fármacos</li> <li>Agente antibacterianos</li> </ul>				



## Machine learning and neural networks

Our upcoming patents are based on experimental development of HTC (hydrothermal carbonization) processes assisted with microwaves, utilizing available variables such as precursor characteristics, prior physical treatment, temperature and its gradient, pressure, residence time, phases, catalysts, etc., all tailored to achieve the desired target material. We initially employ active learning, which relies on a small dataset, selection of the learning model (regression algorithms, decision trees, neural networks, SVM), initial training, model evaluation, selection of informative instances, labeling, model update, iterative evaluation, and a stopping criterion.

Currently, we are applying this model to enhance the adsorption surface of activated carbon and optimize the number of phases efficiently. The significant advantage lies in the substantial reduction of the number of iterations required to achieve the best result, leading to cost savings and improved operational efficiency.



## laboratory and contracts with OPIS

