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# CELISE 2022 meeting

## Quick Roundtable: IChF



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*Institute of Physical Chemistry (in Warsaw), Polish Academy of Sciences (IChF -PAN)*

7<sup>th</sup> December, 2022



# Index

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- Institute of Physical Chemistry - Polish Academy of Sciences
- Main expertise and capacities
- Interests in CELISE
- Key staff participating in CELISE



07/12/2022

CELISE 2022 meeting



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- The Institute of Physical Chemistry (IPC) of the Polish Academy of Sciences was founded in 1955.
- It was the first research institute dedicated to chemical sciences in Poland, and consists of 29 research groups in 9 Departments with 270 permanent Staff members and 90 international doctoral students, postdoctoral fellows, and invited scientists from different countries worldwide.
- The research staff members and young scientists conduct research in inorganic, organic, physical, bio and pharmaceutical chemistry.
- Research teams associated with large, national or international research projects, consortium and science networks.
- The Institute's excellence is recognized by the European Commission and Polish authorities; we are a European Centre of Excellence – “TALES”, “Centre for Photoactive Materials,” and “SURPHARE.”



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## Important UE projects:

- Call: **H2020-MSCA-RISE-2014**, project pt.: "Metallocomplexes of macrocyclic compounds for photonic devices", akronim: METCOPH, wartość projektu 688 500 Eur;
- Call: **H2020-WIDESPREAD-2014-2**, project pt.: "The CREAtion of the Department of Physical Chemistry of Biological SysTEms", wartość projektu 2 765 124 Eur
- Call: **H2020-FETOPEN-2014-2015-RIA**, projekt pt." New technological advances for the third generation of Solar cells", akronim GOTSolar, wartość projektu 2 993 404 Euro
- **H2020 MSCA-COFUND**: "Interdisciplinary NANoscience School: from phenoMENology to applicationS (NaMeS)" (H2020-MSCA-COFUND-2015/H2020-MSCA-COFUND-2015, Grant agreement: 711859, 2016-2021)."
- **H2020 MSCA-RISE-2016**: acronim CONIN, Grant agreement: 734276, 2017-2021
- **H2020 – ICT-2017-1**; acronym IMCUSTOMEYE, Grant agreement: 779960, 2018-2022;





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### Key Research Facilities:

- Specialized laboratories, such as: Laboratory of High Pressure, Laboratory of X-ray Structural Analysis,
- Laboratory of Calorimetry, Laboratory of Chromatographical Analysis,
- Laboratory of Molecular Films,
- Laboratory for Solid State Nuclear Magnetic Resonance, Mazovia Center for Surface Analysis,
- Laboratory of X-Powder Diffractometry and Spectroscopy,
- Laboratory of Electrochemistry and Surface Analysis in Corrosion Studies,
- Laboratory of Spectroscopy and Photochemistry, Molecular Beam Laboratory, Laser Centre.

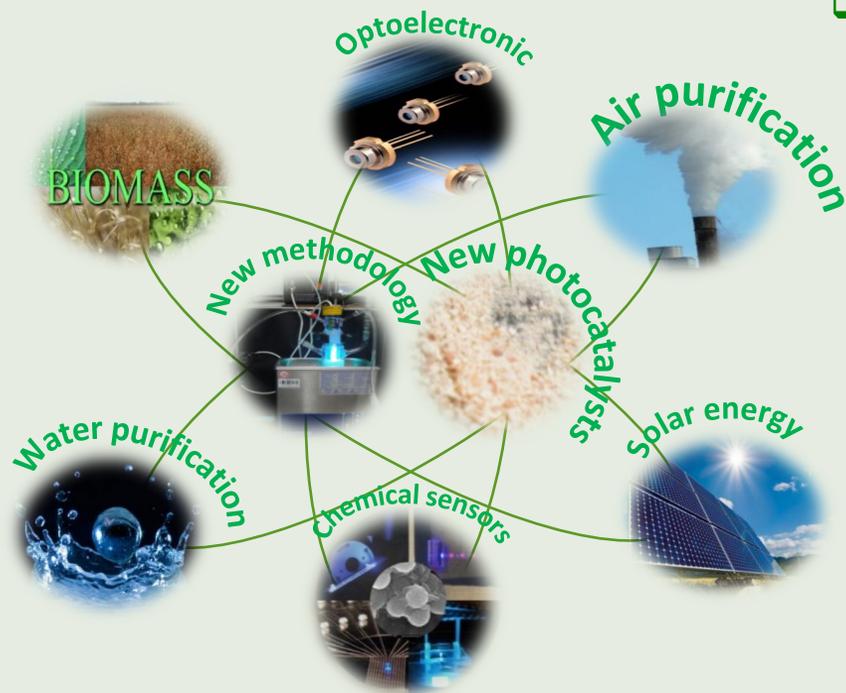
### ...and more...:

- Two spin-off companies, and as the first institute of the Polish Academy of Sciences, we took up shares in a spin-off company pursuing scientific research and designing microfluidic devices for medical and biotechnological applications.
- Collaborations with more than 40 universities and scientific institutions worldwide, incl: Harvard University, Max Planck Institutes, Ecole Normale Supérieure, University of Oxford and University of Cambridge, Universidad Cooperativa de Colombia, ...,



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- ❑ Rational design of functionalized nanosized catalysts using unconventional methodologies (e.g., sonication, photo-assisted methodologies).



- ❑ Sonocatalytic and photocatalytic green pathways in organic synthesis.

- ❑ Catalytically harvesting of solar energy in the shape of chemical energy.

- ❑ Development of novel proof of concepts of catalytic processes for the treatment and purification of water and air.

- ❑ Catalyst preparation and optimization, surface chemistry, nanoengineering, catalyst poisoning/degradation, catalytic process design, chemical/reactor engineering and reaction kinetics.

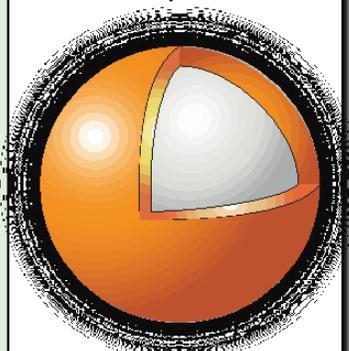
- ❑ Thermo-catalytically, Sono-catalytically and Photo-catalytically valorization of any kind of organic wastes (CO<sub>2</sub> included) in aqueous and gaseous systems.



## Ultrasonication as a tool in nano-synthesis: our experience

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tune the  
surface chemistry  
of nanoparticles



CHEMICAL  
ENGINEERING  
JOURNAL

10.1016/j.cej.2020.125099

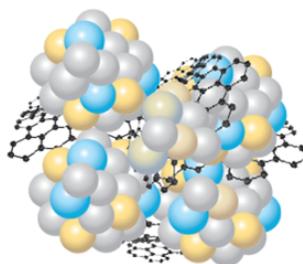
1-D titanate  
nanotubes



CHEMICAL  
ENGINEERING  
JOURNAL

10.1016/j.cej.2021.128907

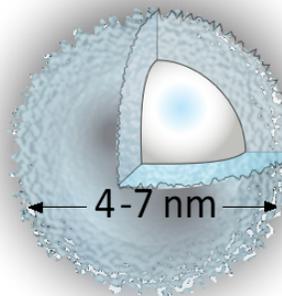
nanocomposite  
formation



CHEMICAL  
ENGINEERING  
JOURNAL

10.1016/j.cej.2020.125099

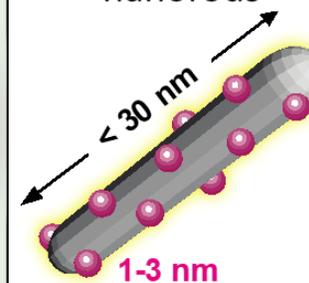
core-shell  
nanoparticles



ADVANCED  
FUNCTIONAL  
MATERIALS

10.1002/adfm.202007115

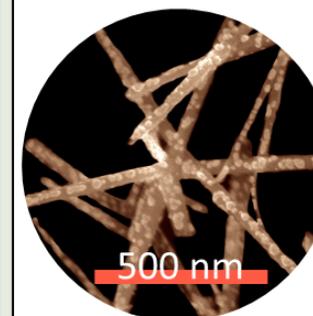
1-D TiO<sub>x</sub>  
decorated  
nanorods



CATALYSIS  
COMMUNICATIONS

10.1039/D0GC00329H

1-D MnO<sub>2</sub>  
nanorods

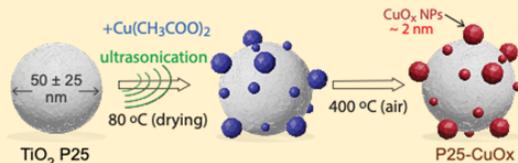


APPLIED  
CATALYSIS  
B: ENVIRONMENTAL

10.1016/j.apcatb.2019.117803

nanocluster decoration on nanoparticles

MOLECULAR  
CATALYSIS

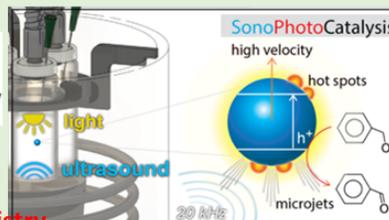


10.1016/j.cej.2021.128907

SonoPhotoCatalysis

Green  
Chemistry

2020  
Green Chemistry  
Hot Articles

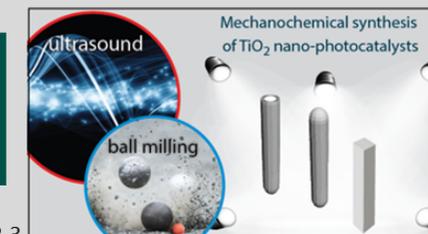


doi: 10.1039/D0GC00329H

Mechanochemical forces as a synthetic tool for zero and one-dimension titanium oxide based nano-photocatalysts

Topics in  
Current  
Chemistry

10.1007/s41061-019-0262-3





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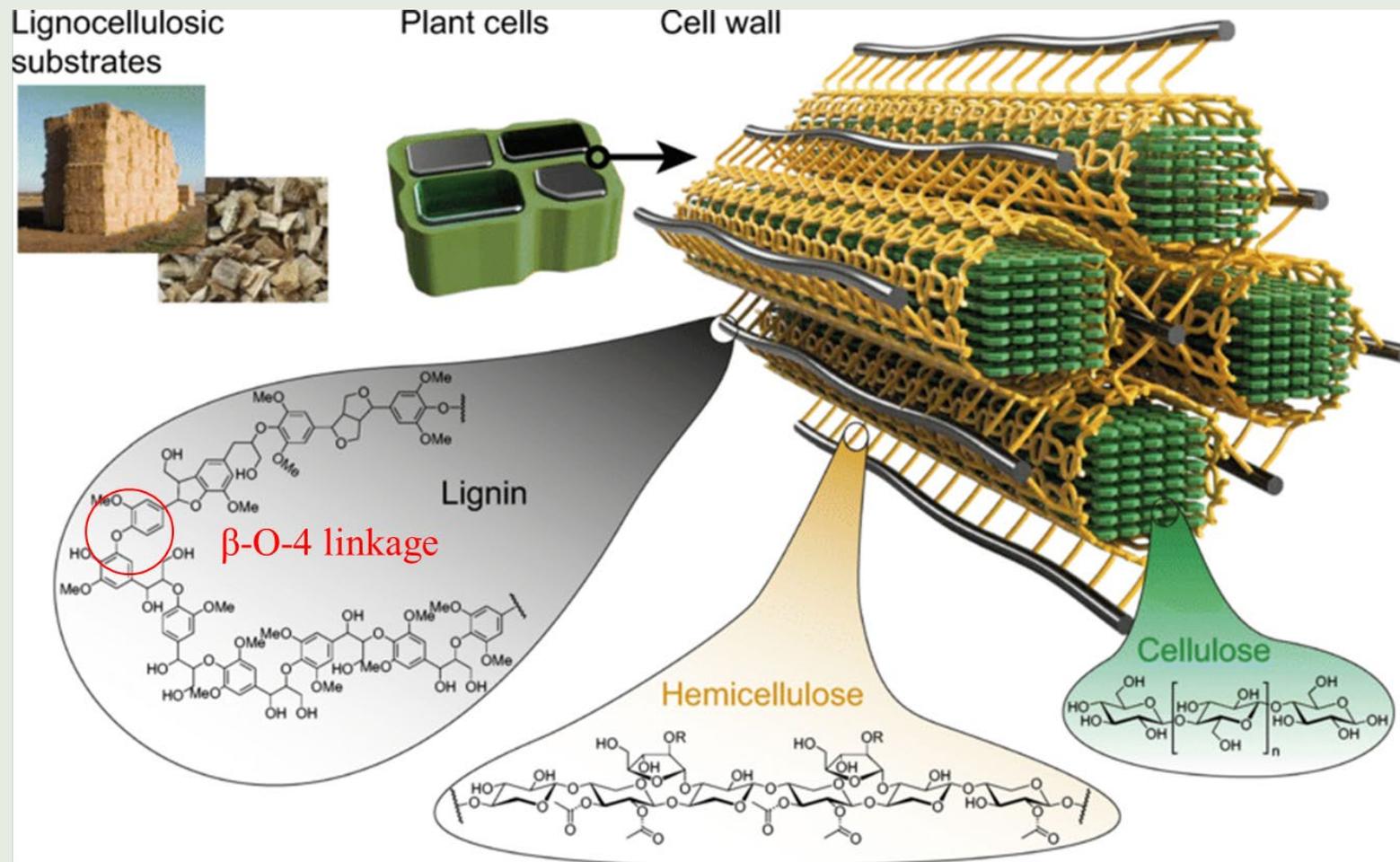
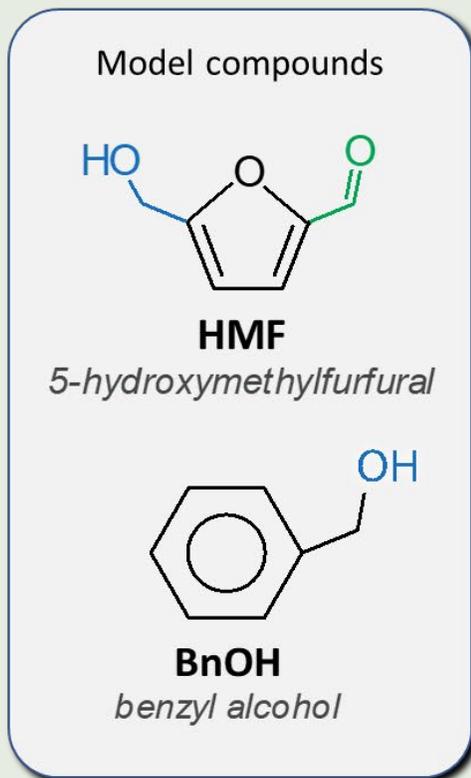
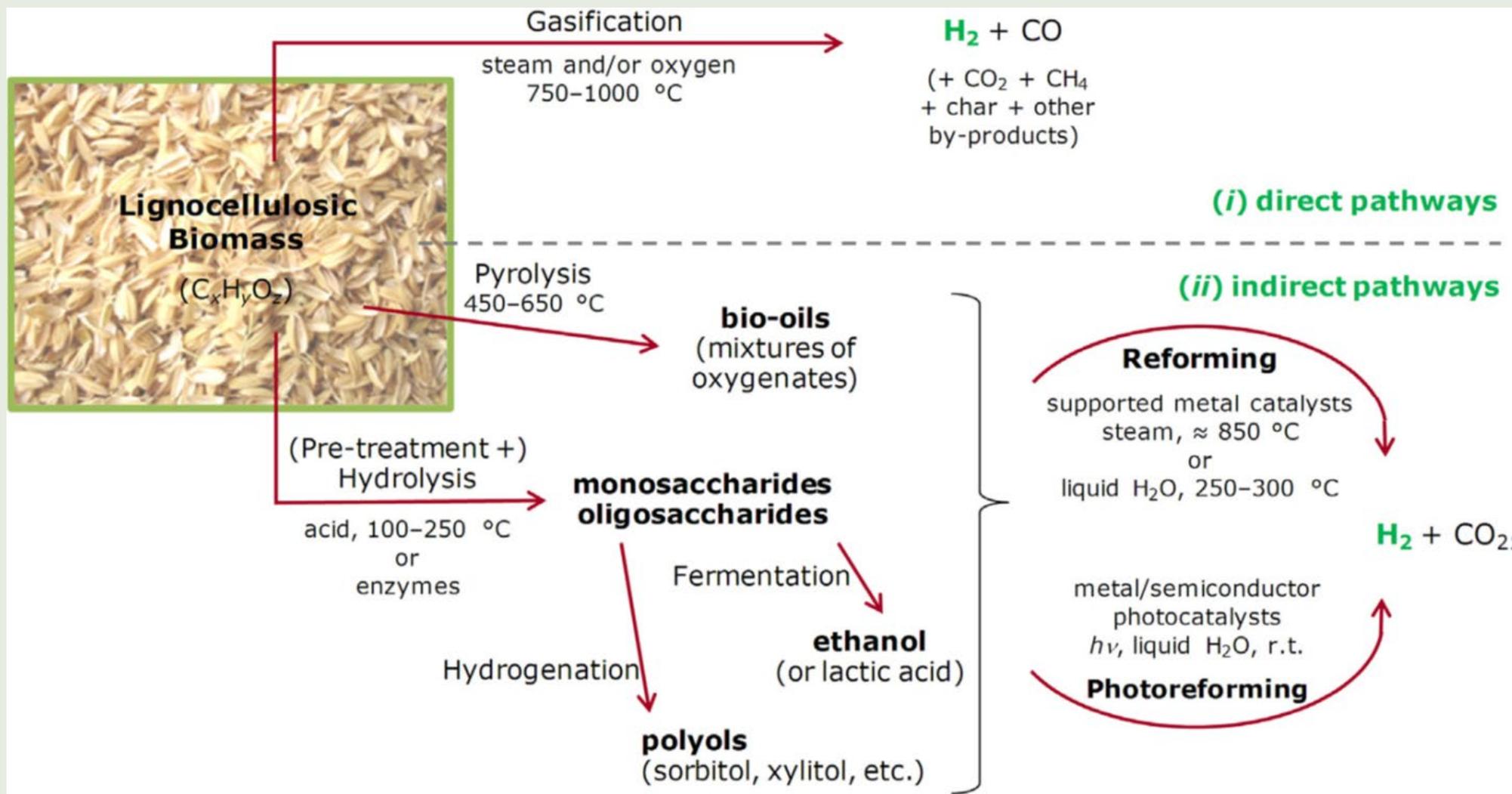


Image: Courtesy of Dr. D. Giannakoudakis



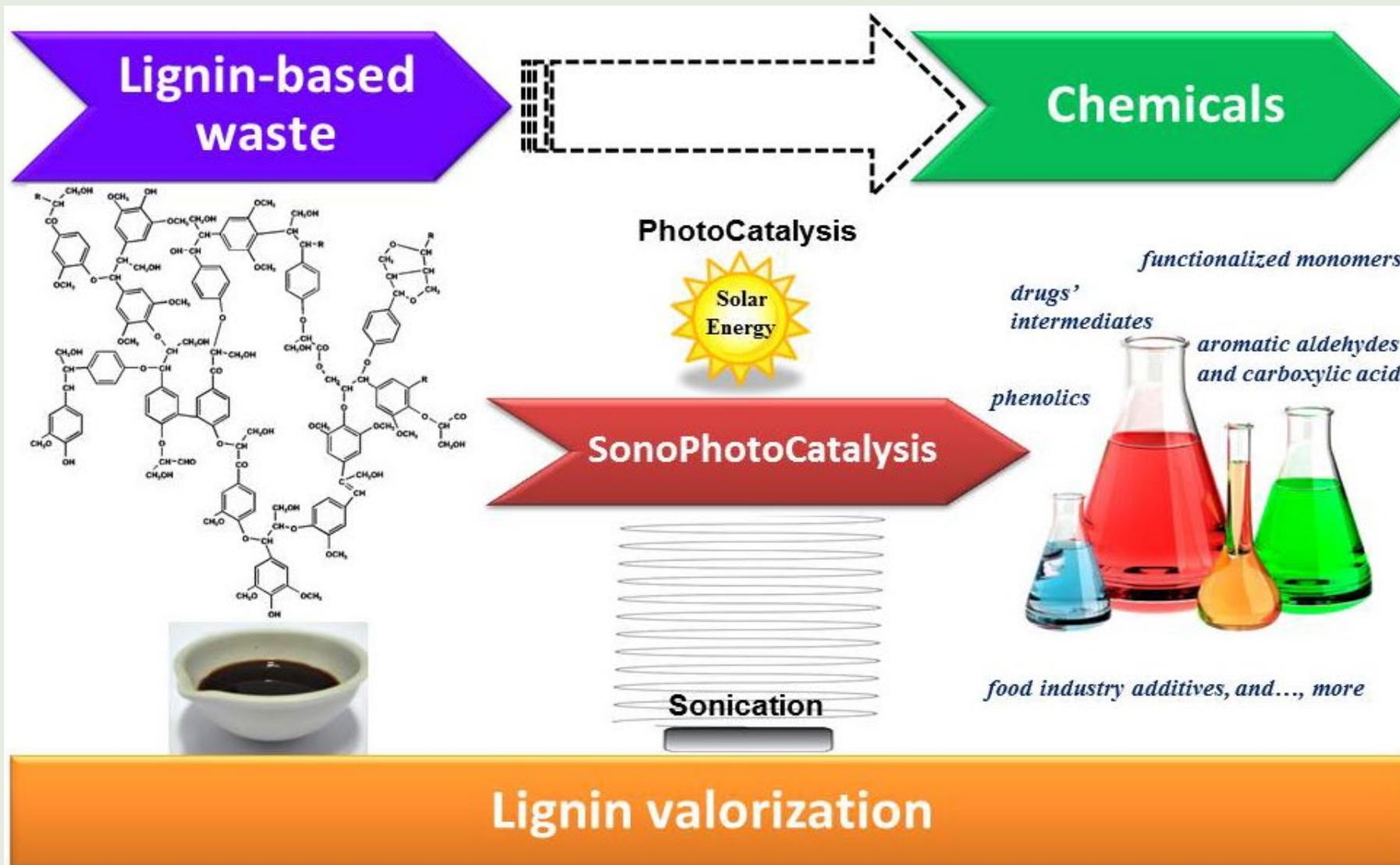
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A.V. Puga, *Coordination Chemistry Reviews* 315 (2016) 1–66



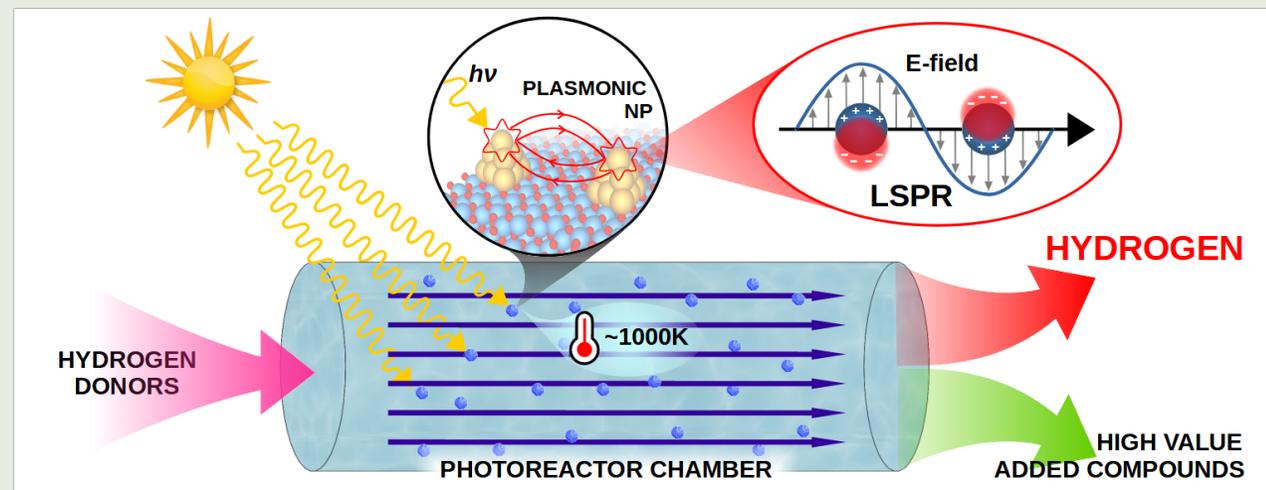
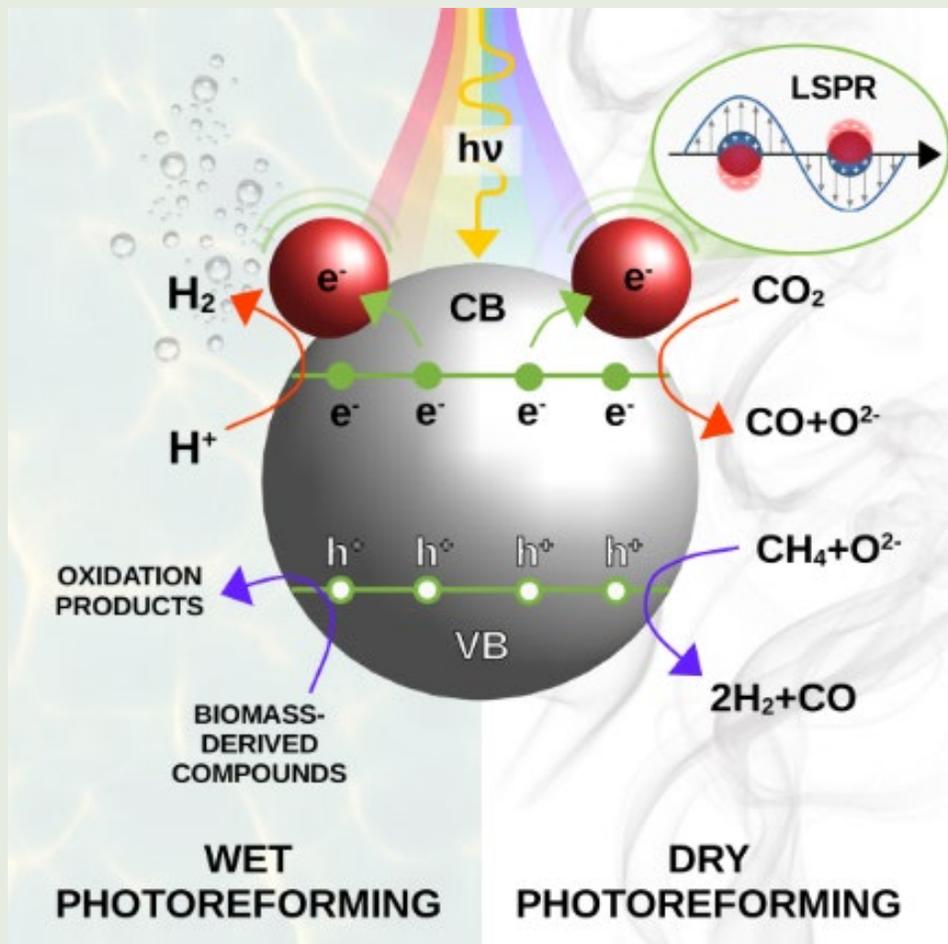
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Colmenares *et al.* ChemCatChem, 9 (2017) 2615 – 2621.



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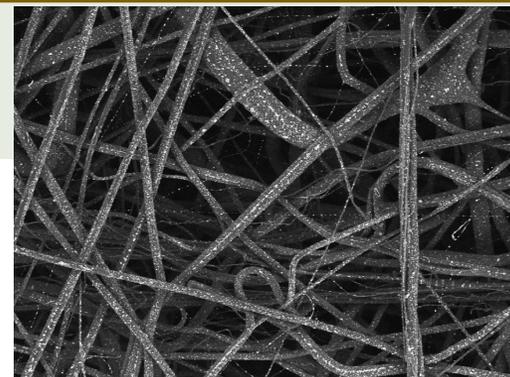
Colmenares et al.,: ChemSusChem, 12 (2019) 2098-2116;  
ChemCatChem, 13 (2021) 4458–4496;  
Catalysis Today, 380 (2021) 156-186



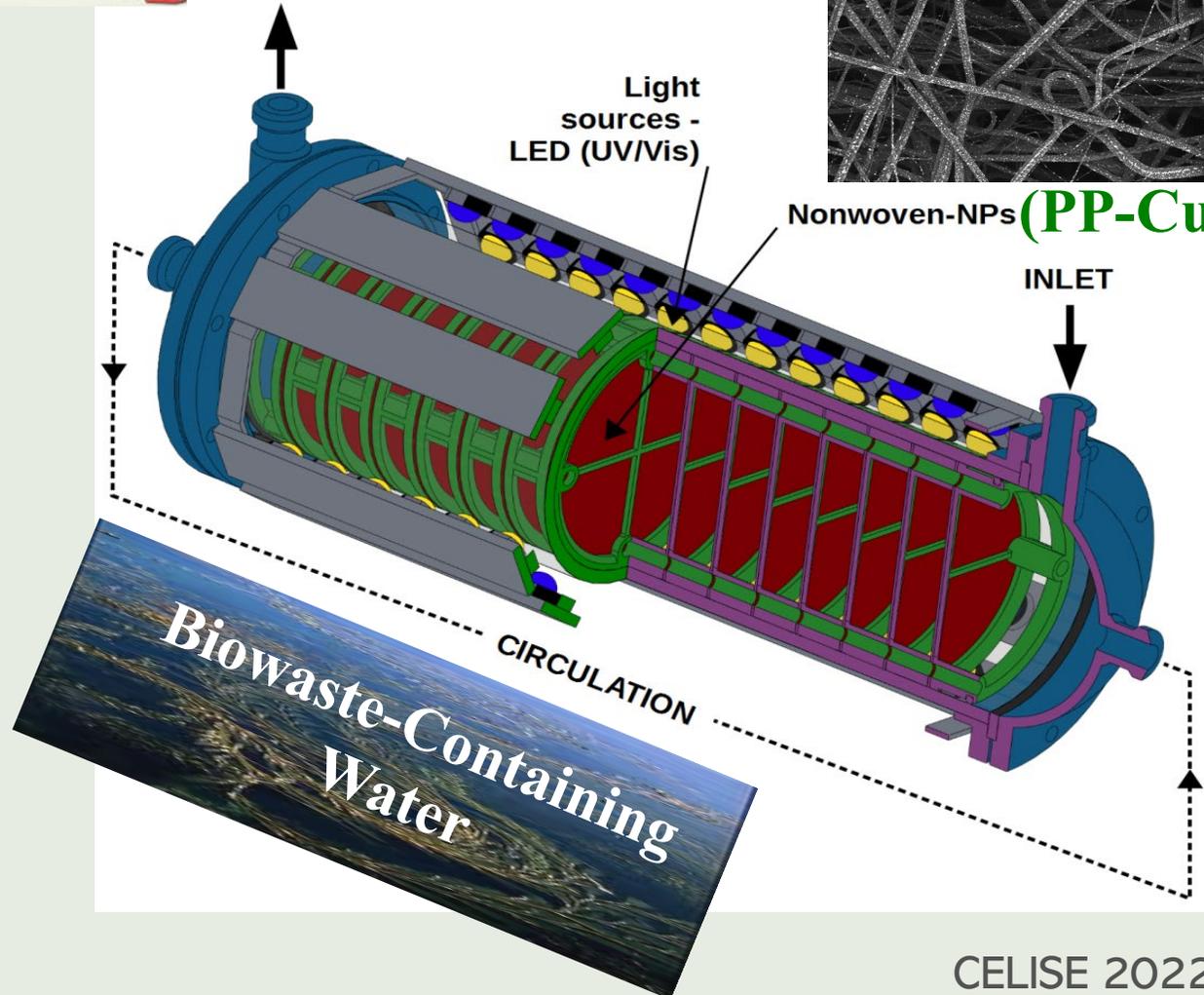
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**H<sub>2</sub>** HYDROGEN



Nonwoven-NPs (**PP-Cu/TiO<sub>2</sub>**)



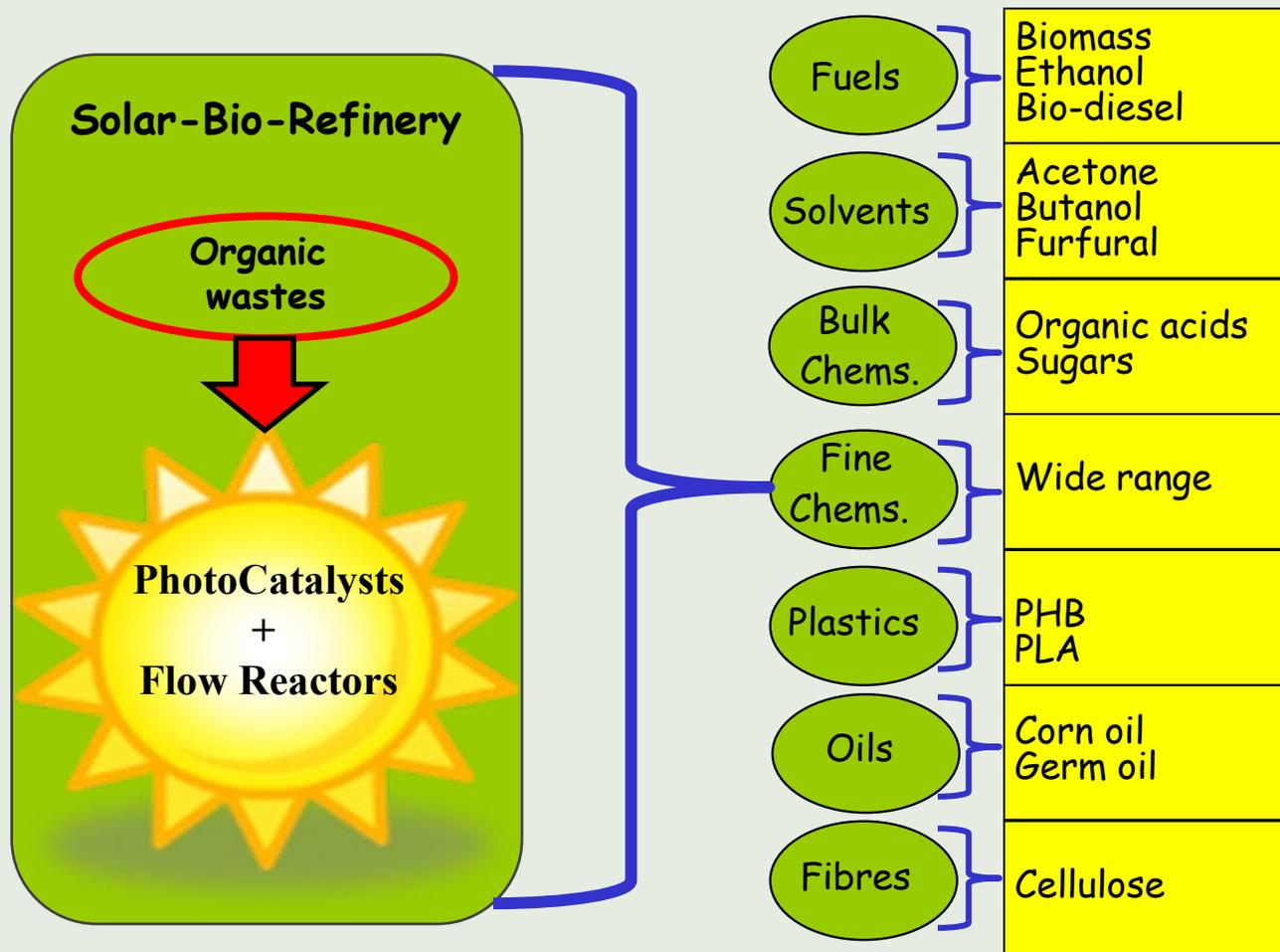


ICHF

# Colmenares's research group nr 28



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Colmenares: *Current Opinion in Green and Sustainable Chemistry*, 15 (2019) 38–46



# Interests in CELISE

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**Expertise and facilities related to the scientific work (WP1)** Scanning microscope, X-ray diffractometer, Chromatographic lab, surface analysis lab, catalytic methods for sustainable solutions. **(WP2)** Modelling tools **Human resources:** leading research institution dealing with various aspects of chemistry, and it is among the best scientific units in Poland. HR Excellence in research logo. **Other infrastructure:** ...library, labs, wifi, rooms and all needs to support the secondments

## We are interested in:

- a) SME and rural areas in Colombia,
- b) The use of Deep Eutectic Solvents (DES) in flow (sono)photocatalysis for biomass valorization,
- c) The usage of lignin fraction to produce:
  1. Materials (including high quality Biochar),
  2. New aromatic-based intermediates for new drugs/food additives (e.g. bio-pharmaceuticals).



# Interests in CELISE

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(1i) best characterisation methods; (1.iii) best pre-treatment of lignocellulosic biomass; (2.iii.1) novel tools and procedures of characterisation and simulation of lignocellulosic biomass; (2.vi) to contribute to the bio-based economy in Europe and South America.

Sending: 3 PM  
(3 second.)  
Hosting: 2 PM  
(1 second.)

4.2 Web page and  
scientific results



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*“Catalysis for sustainable energy production and environmental protection, CatSEE”*

Visit our web site: <http://photo-catalysis.org/>



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**Marta**



**Juan Carlos**



**Swaraj**



**Nilesh**



**Dariusz**



**Behdokht**



**Abdul**



**Lena**

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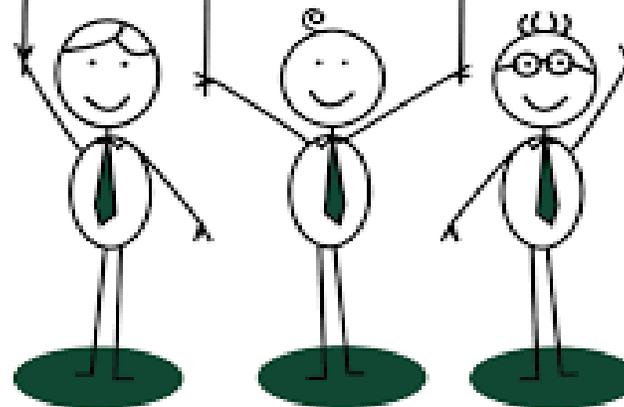
# Acknowledgments

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Thank  
you



¡GRACIAS!



## Recent projects:

**Sonata Bis Nr. 2015/18/E/ST5/00306**

**OPUS-13 project nr 2017/25/B/ST8/01592**

**OPUS-20 project nr 2020/39/B/ST5/00076**



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