# National Institute of Chemistry Ljubljana, Slovenia

Your partner in Excellence





In expanding knowledge of chemistry and associated studies In transferring knowledge to younger generations In applying newly acquired knowledge to industry

#### Two main research areas



#### Advanced materials and Engineering





## LC-GD-1-2-2020

- Towards Climate-Neutral and Socially Innovative Cities
- We can contribute with <u>double passivation with galvanic</u> <u>displacement approach</u>, and to achieve up to 40% increase in ECSA, a 2-3 fold increase in catalytic activity, as well as an intermetallic crystal structure with increased stability towards corrosion. We also have a <u>unique set of advanced</u> <u>characterization methods</u>: identical location electron microscopy (TEM and SEM), in-situ heating electron microscopy (TEM), high-temperature half-cell electrochemical degradation setups, electrochemical flow cell coupled to an ICP-MS, EC-MS, XRD, FIB-SEM, floating electrode half-cell setup, Raman, etc



## LC-GD-2-1-2020

 Demonstration of innovative critical technologies to enable future large-scale deployment of offshore renewable energy technologies and their integration into the energy system.

 We can contribute with <u>innovative coating</u> <u>development.</u>



### LC-GD-2-2-2020

- Develop and demonstrate a 100 MW electrolyser upscaling the link between renewables and industrial applications.
- We can contribute with <u>dynamic multiscale</u> <u>modelling of systems</u>. We can enter the consortium together with a <u>large industry</u> <u>partner from Slovenia</u>, where demonstration can take place.



## LC-GD-3-1-2020

• Closing the carbon cycle in industry: renewable energy driven reduction of CO2 using innovative catalytic materials and technologies.

 We can contribute with <u>assessing techno-</u> <u>economic impact, multiscale modelling,</u> <u>optimization of energy balances</u>. We can bring to consortium a <u>large industry partner from Slovenia</u> ready to be the demonstration example.



## LC-GD-3-2-2020

- Demonstration of systemic solutions for the territorial deployment of the circular economy.
- We can contribute with <u>lignin valorization</u> together with <u>international partners</u>, which we can bring to the consortium. We can offer the <u>multilocation system and small scale</u> <u>biorefinery system</u>.



NATIONAL INSTITUTE OF **CHEMISTRY** 



#### LC-GD-5-1-2020

• Green Airports and Ports: green aviation and shipping.

 We can contribute with <u>development and</u> <u>characterisation of lignocellulosic or CO2</u> <u>based aviation fuels, renewable fuels</u>, and with <u>multiscale modelling</u>.



#### LC-GD-6-1-2020

- Testing and demonstrating systemic innovations in support of the Farm-to-Fork Strategy
- We can offer <u>novel fungicides</u>. Various plant pathogens secret NLPs (Nep1-like proteins) during plant infection, eliciting immune response and causing cell death. These NLPs represent an important molecular target for the development of new phytopharmaceutical products. <u>The technology relates to compounds</u> that can serve as inhibitors of NLPs and can be used for the prevention of plant diseases caused by plant pathogens, which use NLPs in their toxicity mechanisms, e.g. for controlling oomycetes of the genus Phytophthora causing potato or tomato blight.
- <u>Application</u>: Protecting crops against plant diseases caused by plant pathogens that express NLPs (e.g. root rot, downy mildew, anthracnose, soft rot, early blight and late blight and some others).
- We can offer <u>analytical support</u> in the field of <u>bioactive compound extraction</u>, their <u>qualitative and quantitative analysis</u>, their <u>targeted and untargeted analysis</u>, their <u>isolation</u>, <u>process scale-up</u>, <u>formulation of the isolated bioactive compounds</u> and further <u>characterization</u> of the obtained products.



#### LC-GD-8-1-2020

- Innovative, systemic zero-pollution solutions to protect health, environment and natural resources from persistent and mobile chemicals
- We provide <u>innovative materials for cleaning of waste waters</u>. They remove endocrine disruptors like BISFENOLA and all organic pollutants, working on the basis of adsorption and photo reduction / photo oxidation. We developed a <u>characterization method for detecting microplastics of sice from few nanometers to 30 nanometres</u>.
- NIC develops <u>sensors for heavy metals, COVID-19, and trace elements in</u> <u>air</u>. Airborne particular matter (PM) is a pollutant of major concern. Due to their unique physico-chemical characteristics, atmospheric aerosols (i.e., PM dispersed in the air) induce climate forcing by influencing the radiative balance of the Earth (directly and indirectly by their involvement in cloud formation) and cause harm to the ecosystem and human health. NIC develop sensors for detection.



#### LC-GD-9-3-2020

- Transparent & Accessible Seas and Oceans: Towards a Digital Twin of the Ocean
- We provide <u>innovative materials for cleaning of</u> <u>waste waters</u>. They remove endocrine disruptors like BISFENOLA and all organic pollutants, working on the basis of adsorption and photo reduction / photo oxidation. We developed a <u>characterization method for detecting</u> <u>microplastics of sice from few nanometers to 30</u> <u>nanometres</u>.



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