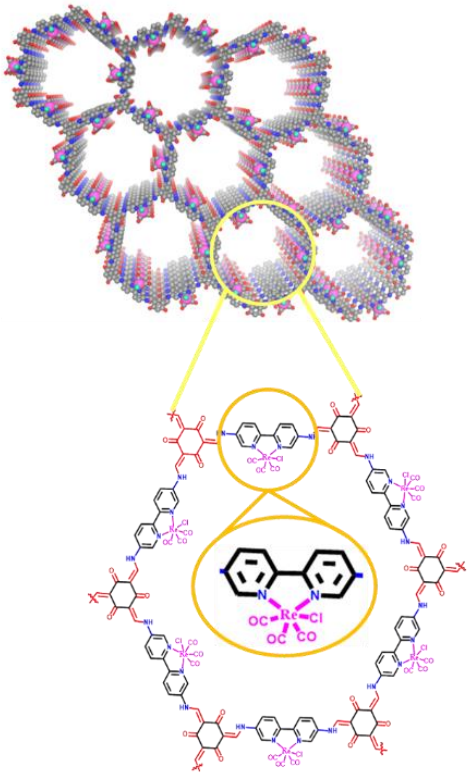
Ph.D. position in Chemical Physics, Lund University, Sweden

Spectroscopy driven design of hybrid photo-catalytic systems for efficient CO_2 to fuel conversion

Global carbon dioxide emission is increasing. Using the sun's energy to capture greenhouse gases and converting it into fuel or other useful chemicals, is an attractive possibility – sunlight is plentiful, the amount that hits Earth during one hour corresponds to humanity's total energy consumption for an entire year. However, there is still no satisfactory solution. The current project is about finding the way forward.

In a recent study published in Nature Communications (Ultrafast charge transfer dynamics in 2D covalent organic frameworks/Re-complex hybrid photocatalyst) we apply a combination of materials that absorb sunlight and convert carbon dioxide. The conversion is complex requiring multiple electrons reacting in well-orchestrated sequence of steps. Such reaction can easily go wrong returning back to the beginning – the very stable CO_2. With the help of lasers, we have identified the initial key steps of the conversion reaction and the bottlenecks of the process. Before we can start thinking about a true carbon dioxide converter, these steps need to be refined. This is what the PhD project is about. We will use advanced laser spectroscopy and large-scale synchrotron facilities to understand the details of the photo-catalytic CO_2 conversion to fuel by catalytic centers in a porous organic material called COF – covalent organic framework. The aim is to guide material design based on the new understanding. The long-term target of the work is the development of a sun-driven catalytic system that absorbs carbon dioxide from the atmosphere and converts it into fuel or useful chemicals.



The 3D structure of the COF together with a zoom in to a main building unit where the catalytic complex is highlighted.

We seek a talented and enthusiastic student eager to pursue a career in laser spectroscopy of materials. You should be open minded, curious and ready to take initiative. You will work in an interdisciplinary and very active team involving experts in advanced spectroscopy, material science, as well as large scale synchrotron and XFEL facilities. The group is a member of NanoLund and Lund Laser Centre, and the group leader coordinates LU profile area Light and Materials. The project is funded via the WISE initiative of KAW foundation.

Interested? Follow the link https://lu.varbi.com/what:job/jobID:601117/ to apply.

For further information, contact Prof. Tõnu Pullerits tonu.pullerits@chemphys.lu.se