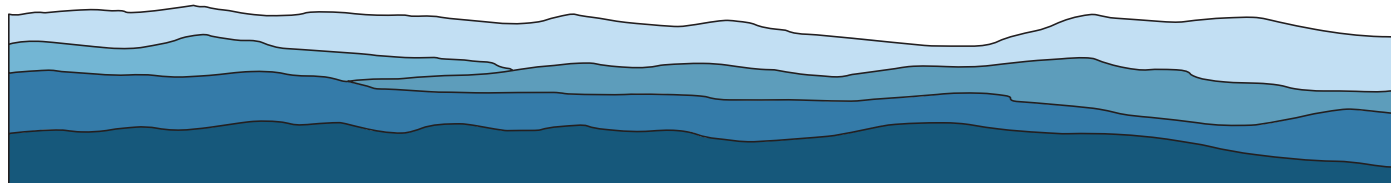


# HIGHLANDS IN CHEMISTRY SEMINAR SERIES



## MARKUS ANTONIETTI

MAX PLANCK INSTITUTE

**“The Carbon-Nitrogen-Materials space: from supercatalysts to new energy storage to unexpected quantum effects”**

MARCH 12, 2021

2:30PM ET

ZOOM

FACULTY HOST:  
GREG LIU

Throughout the search for simple candidates for artificial photosynthesis and heterogeneous organocatalysis, carbon nanostructures (or better: organic carbonaceous solids with heteroatom doping and edge functionality), turned out to be unexpectedly efficient. N-doped carbons, C<sub>2</sub>N, or Carbon Nitride: all these systems are easy to make and mostly based on available and sustainable precursors. To the general surprise, such carbocatalysts not only outperform even noble metals and some enzymes, but are at the same time more stable and less sensitive against side reactions, i.e. possess adjusted but selective chemical functionality.

Beside introducing these materials and their physical chemistry, I will focus on “heterojunction chemistry”, namely what such structures do with old and apparently well-known species as metallic gold. I will present how the nobility of gold can be changed, for the purpose of catalysis enabling even new chemical reactions, such as the room temperature ammonia synthesis or the electrochemical synthesis of formic acid from carbonized water.

Another exciting application of such materials is in novel energy storage, both in supercapacitors and battery applications. Using ionic liquids, I will show how such molecular field effects can break previous limits of energy density. If time allows, I will also present the realization of SEI membranes and light driven ion pumps based on simple chemical components, only.