

# Hydrothermal carbonization of Biomass: A “Chimie Douce” towards high end carbon nanostructures and carbon-negative product cycles

Markus Antonietti, Maria-Magdalena Titirici

MPI of Colloids and Interfaces, Research Campus Golm, D-14424 Potsdam, Germany, e-mail:  
pape@mpikg.mpg.de

Hydrothermal carbonization (HTC) is a chemical process to turn carbohydrates (sugars, cellulose, crude biomass) into products which –depending on reaction conditions- resemble peat, brown coal or black, “industrial” carbons. HTC mimics the natural process of coalification, but is highly accelerated to about 1 – 24 h reaction time by employing elevated temperatures between 180 – 230 °C and appropriate catalytic schemes. It not only works with a broad variety of “waste biomass”, it is also exothermic and therefore potentially independent of outer energy sources. In addition, it is “chemistry”, that is the nanostructure, the surface functionalities, and properties as biodegradability can be varied systematically.

In this talk, I will present the process and a variety of the potential nanomaterials generated thereby, such as carbon nanorods, soil conditioner, battery electrode materials, porous sorption coals, ion exchange resins, or selective sorbents for CO<sub>2</sub> separation. I will also try to give some potential and scale of such type of technology and how it can contribute to a CO<sub>2</sub> - negative society. The figure illustrates the about perfect mesopore architecture of a highly porous carbon made from oak leaves for the purpose of enhanced water and ion binding, i.e. soil improvement:

