unisyscat

# UniSysCat Colloquium

Prof. Dr. Magdalena Titirici

*Imperial College London, Department of Chemical Engineering*

Start Time: Wednesday, September 4, 2019

End Time: Wednesday, September 4, 2019

Chemistry Building, C 264
Technische Universität Berlin, Straße des 17. Juni 115, 10623 Berlin

## Going green with black: On Biomass, Carbon and Clean Energy

Prof. Dr. Magdalena Titirici

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One of the grand challenges facing humanity today is access to sustainable materials and chemicals which are at the heart of sustainable technologies. The production of materials, chemicals and fuels from abundant and renewable resources will eliminate our dependence on petroleum/critical metal-based supplies and will provide access to a new economy based on available reserves.

Carbon is the most versatile element known. It combines with other (carbon) atoms giving rise to new carbon materials with astonishing properties. The versatility and potential of carbon has attracted top recognition in the last decade for the work in fullerenes (1996 Nobel Prize in Chemistry), CNTs (2008 Kavli Prize in Nanoscience) and grapheme (2010 Nobel Prize in Physics). However, the mystery and wonder of carbon offers more to discover.

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While carbon is widespread on Earth, it has been mainly synthesized from fossil fuel-based precursors with sophisticated and energy consuming methodologies that generate toxic gases and chemicals. The preparation of carbon materials from renewable resources is a key research challenge in terms of sustainability, climate change and economics. Since the beginning Nature created carbon from biomass.

We have demonstrated that it is possible to mimicking the natural process of carbon formation and prepare carbon nanomaterials from biomass using mild hydrothermal processes. Along with amorphous carbon materials (denoted HTC), this procedure also enables biomass transformation into useful chemicals such as 5-hydroxymethylfurfural (5-HMF) or levulinic acid (LA). Recently, we have discovered a third product of Hydrothermal Carbonisation - a crystalline form of carbon - arising at the interface between the amorphous HTC microspheres and the aqueous phase containing the biomass-derived chemicals.

In this talk I will present some of the fundamentals governing the production of carbon nanomaterials and chemicals. We will also discuss the application of HTC materials in electrocatalytic reactions such as Oxygen Reduction Reaction as well as for energy storage in Na-ion batteries and supercapacitors.

Finally, some of the photo-physics governing the optoelectronic properties of the new family of fluorescent hydrothermal carbon nanocrystals will be presented.

Prof. Dr. Arne Thomas

Organizer