

CASE STUDY

Utilising equipment and expertise via BRISK Transnational Access



Muhammad Rashed Javed of the Polytechnic University of Catalonia, Spain, visits the Chemical Process and Energy Resources Institute (CPERI) of the Centre for Research and Technology Hellas (CERTH), Greece, to work with their experienced catalysis researchers

My visit to the Chemical Process and Energy Resources Institute (CPERI) at the Centre for Research & Technology Hellas (CERTH), Greece was a great learning experience. Through BRISK I got the opportunity to work under the supervision of Dr Efthymios Kantarelis, a post-doctoral fellow at KTH Royal Institute of Technology in Sweden who was also visiting the facility. CPERI has a highly developed catalytic pyrolysis facility with experienced researchers, thereby giving me the chance to benefit from the staff's valuable knowledge. It was also the first time I had been able to work at a biomass pyrolysis facility with both lab and pilot plant scale catalytic pyrolysis units.

The aim of my visit was to investigate the potential of catalytic pyrolysis of biomass and lignin using bi-functional catalysts for the production of liquid feedstock. Lignin and woody biomass were used in catalytic pyrolysis experiments using different metal modified zeolite based catalysts. Six different catalysts were tested, namely: HZSM5 zeolite and desilicated HZSM5 (Ds-HZSM5) and its Co and Mo modifications (designated as Co/HZSM5, Mo/HZSM5, Ds-Co/HZSM5 and Ds-Mo/HZSM5 respectively). The experimental facility (Figure 1) consists of a bench-scale fixed bed SS316 tubular reactor (ID 14mm, height 360mm), heated by a 3-zone furnace.

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Figure 1: Catalytic pyrolysis unit at CPERI.



Figure 2: Researchers at CPERI. *Left to right:* Maria Misia, Stylianos Stefanidis, Muhammad Rashed Javed, Dr Efthymios Kantarelis.

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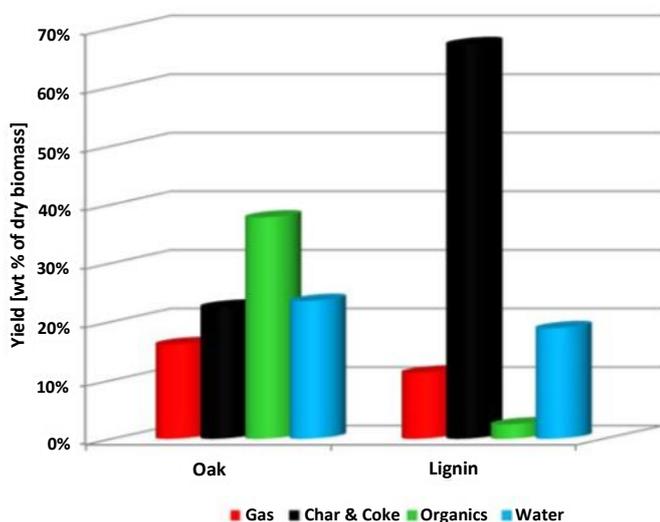


Figure 3: *Left*: Catalytic pyrolysis product yields using different catalysts.

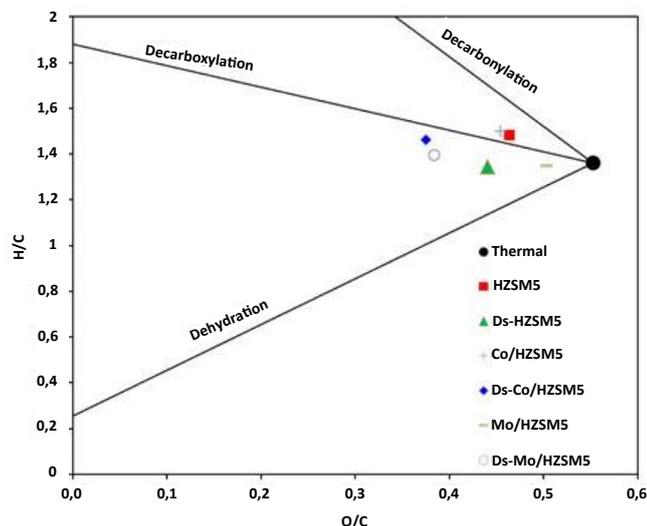


Figure 4: Van Krevelen diagram of organic liquids using different catalysts.

Catalytic pyrolysis yields were first compared in terms of bio-oil, gas and coke formation. Next, the bio-oil was further analysed to determine the organic yield, and then the quality of bio-oil was determined based on the oxygen content of the organics. Finally, the end organic product was analysed to determine its composition. These experiments enhanced my practical understanding of how different techniques can be employed to improve not only product yields but also product quality in this kind of experiment.

My visit lasted three weeks, during which CPERI's researchers were constantly helpful and able to provide guidance. The research at the facility was co-ordinated by Dr Konstantinos Kalogiannis who also provided a guided tour explaining the different aspects of the pilot plant facility and the research being conducted. Also I received all the assistance I needed to facilitate the practical elements of my stay.

I would like to thank Dr Efthymios Kantarelis, my fellow visitor and mentor for all his guidance and effort throughout my time at CPERI, both with regards to research undertaken and to managing the visit. I would also like to thank Dr Konstantinos Kalogiannis for all his help in organising the research at the institute, along with all of the researchers at I worked with. Last but not least I would like to thank the BRISK Project for providing me with such a valuable opportunity.



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