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Lyudmila M Bronstein, Trends in Green chem 2018, Volume 4
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BIOMASS CONVERSION TO FUELS AND VALUE-ADDED CHEMICALS WITH MAGNETICALLY RECOVERABLE CATALYSTS

Lyudmila M Bronstein

Indiana University, USA

Biomass conversion plays a tremendous role in obtaining value-added chemicals and fuels from renewable sources without use of petrochemicals. In the last decade magnetically recoverable catalysts have received considerable attention due to more environmentally friendly processes, conservation of energy, and cheaper target products. In this talk author will discuss the use of magnetically recoverable catalysts for biomass and biooil related processes, including transformations of cellulose to value-added chemicals, syngas (produced by bio-oil pyrolysis) to methanol and methanol to hydrocarbons (fuels) as well as bio-oil hydrogenation to important chemicals. Figure 1 shows high resolution transmission electron microscopy (HRTEM) image of the magnetic zeolite containing Ni nanoparticles (left), its energy dispersive spectroscopy (EDS) map (superposition of Fe and Ni maps, center), and the methanol-to-hydrocarbon (MTH) reaction pathway (right). Modifying the iron oxide (magnetite, Fe_3O_4) amounts, we were able to control the catalyst activity and the product distribution in MTH. The modification of zeolites with Ni nanoparticles allowed us to significantly improve the catalyst stability due to diminishing coke formation and disordering of the coke formed. As is relevant to many catalytic systems, it will be demonstrated that the presence of magnetic iron oxide nanoparticles can enhance catalytic activity or change the reaction mechanism, allowing for more valuable products. In some instances, however, the presence of iron oxide can be detrimental due to side reactions. In such a case, a proper iron oxide nanoparticle protection/stabilization is required to suppress side reactions.

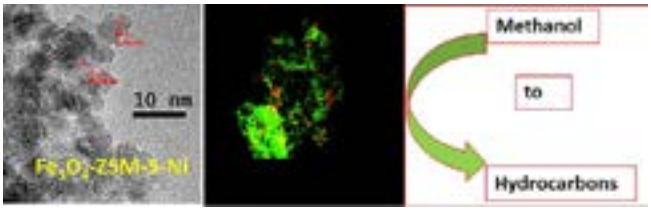

Figure 1: HRTEM image (left) and superposition of Fe and Ni EDS maps (center) of the magnetic zeolite with Ni nanoparticles and the MTH reaction pathway (right)

Recent Publications

1. Das V K, Shifrina Z B and Bronstein L M (2017) Graphene and graphene-like materials in biomass conversion: paving the way to the future. Journal of Materials Chemistry 5:25131.
2. Oracko T *et al.* (2017) Metal ion distribution and oxygen vacancies determine activity of magnetically recoverable catalysts in methanol synthesis. ACS Applied Materials & Interfaces 9:34005.
3. Cherkasov N *et al.* (2017) Hydrogenation of bio-oil into higher alcohols over Ru/Fe_3O_4-SiO_2 catalysts. Fuel Processing Technology 167:738.
4. Alibegovic K *et al.* (2017) Furfuryl alcohol synthesis from furfural over magnetically recoverable catalysts: does the catalyst stabilizing medium matter? Chemistry Select 2:5485.

5. Baird N et al. (2017) Enhancing the catalytic activity of Zn-containing magnetic oxides in a methanol synthesis: identifying the key factors. ACS Applied Materials & Interfaces 9:2285.

Biography

Lyudmila M Bronstein is a Senior Scientist at the Department of Chemistry, Indiana University. During her research career, she published over 210 papers, reviews, and book chapters. Her research program focuses on developing new materials with important applications in the fields of energy, catalysis, and life sciences. Her research group has been working on making solid polymer electrolytes for Li ion batteries with enhanced performance, efficient and selective catalytic systems based on polymers, dendrimers, and mesoporous solids, and multifunctional magnetic nanoparticles for biomedical applications.

lybronst@indiana.edu

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GREEN HYDROGEN SMART GRIDS AND ALKALINE ELECTROLYSIS THE LOW COST HIGH EFFICIENCY SOLUTION

Charles William Dunnill

Swansea University, UK

As the world turns towards a renewable energy dominated energy landscape, the storage of intermittent energy becomes ever more important. Balancing supply and demand is crucial with many intermittent sources not correlating with user requirements. Additionally the energy landscape is changing from a traditional, one to many approach where one power station delivers energy to a multitude of houses and businesses, to more distributive many to many approach where the network is highly complex with multiple sources big and small feeding into the system and many consumers all needing to be balanced. This talk will look at how hydrogen holds a potential solution to decoupling of supply and demand and the reconfiguration of the network. All renewable energy sources that are not immediately consumed can be converted into hydrogen which acts as a universal energy vector storing and distributing the energy where needed. We will show how new water splitting technology can achieve low cost, high efficiency energy transition and how a green hydrogen smart grid has been operated in Swansea. We will also look at potential projects around the world that could benefit from installations.

Water+ ENERGY→ H_2+$O_2$$H_2$+$O_2$→Water+ENERGY

Recent Publications

1. Jones D R, Al-Masry W A and Dunnill C W (2018) Hydrogen-enriched natural gas as a domestic fuel: An analysis based on flash-back and blow-off limits for domestic natural gas appliances within the UK. Sustainable Energy & Fuels DOI: 10.1039/C7SE00598A.
2. Phillips R and Dunnill C (2016) Zero gap alkaline electrolysis cell design for renewable energy storage as hydrogen gas. RSC Advances 6:100643-100651.
3. Phillips R, Edwards A, Rome B, Jones D and Dunnill C W (2017) Minimising the ohmic resistance of an alkaline electrolysis cell through effective cell design. International Journal of Hydrogen Energy 42(38):23986-23994.

Biography

Charles William Dunnill is now a Senior Lecturer at the Energy Safety Research Institute at Swansea University. He has completed MSc in Chemistry from Nottingham and PhD in Nanomaterial's from Glasgow University. His previous posts at UCL Chemistry include a prestigious Ramsay Fellowship and a Post-doc in photocatalytic self-cleaning materials and photocatalysts. He runs a team of researchers interested in the sustainable hydrogen innovation and technology.

C.Dunnill@swansea.ac.uk

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NEW INSTITUTIONAL STRUCTURE IN CHINA'S RURAL WASTE RESOURCES REUSED: CASE ANALYSIS BASED ON BROKERAGE COOPERATIVES

Fang Wang[1, 2]

[1]Sichuan Agricultural University, China

[2]Copernicus Institute of Sustainable Development - Utrecht University, Netherlands

Statement of the Problem: Under the constraints of resources and environment, the livestock husbandry in China stays at a critical stage of its transformation and upgrading. Facing with the inevitability of scale development and the severity of livestock waste pollution, the standard of the treatment of livestock and poultry manure has been increased and thus some barriers appeared, such as the increase of farmer pollution control costs, the imperfect manure trading market and so on. These barriers hinder the development of animal husbandry in China. The Chinese government invites private actors to enter the field of rural waste resources reused policy implementation. In such a situation, where a former hierarchical political system becomes organized more horizontally, the question emerges how the transformation in more horizontal structures can be brought about and how do actors get into contact so that they create these institutional arrangements that are needed for more sustainably to govern the waste reused? In this paper, the purpose is to analyze a new institutional structure that was created by four actors and examine the development of new horizontal structures on one level of analysis.

Methodology & Theoretical Orientation: Under the framework of institutional economics, the analysis will look at the role of the broker in creating such new horizontal connections based on a case analysis of Qionglai Lvhuan cooperative, which is one of the first brokerage cooperatives in China. This cooperative has developed out of market demands, specialized to transport and distribution of livestock and poultry waste.

Findings: Based on the case analysis, we found that this new institutional structure caused to reduce the farmers pollution cost, increase the cooperatives profit, enhance farmers economic benefits, recycle and reuse the fecal waste, improve soil quality, supply more safety and quality agricultural products and decrease government environmental burden. Also, there still exist some problems needing to resolve in the future, such as manure fertilizer quality needs to be improved, transportation networks are to be reasonably built and so on.

Conclusion & Significance: The institutional structure has been playing an important role in overcoming the barriers that hinder the development of animal husbandry in China. Thus all actors would make concerted efforts to promote it more widely. The finding of this study may also suggest new directions for research to determine the optimal price and equilibrium of brokerage cooperatives' market.

Recent Publications

1. Fang Wang, Jing Xiu Yang, Hong'an Xiao, etc. Study on Recycle Agriculture: Theories, Methods and Practices, China Agriculture Press, 2014.01
2. Yan Bin Qi, Gang Wang and Fang Wang (2013) Low-carbon Development of Agriculture: Mechanism, Dilemma, Pattern and Institutional Design, China Agriculture Press,.10 4
3. Fang Wang (2012) Study on Development of Recycle Agriculture under Integration of Ecological Industry Chain and Ecological Value Chain, China Agriculture Press,.12
4. Fang Wang, Jun'an Chen (2009) A Case of Study on Energy Control in a Recycle Agricultural Household System based on Input-output Model. Journal of Agricultural Mechanization Research 31(8):15-19 24

5. Fang Wang and Junan Chen (2009) Analysis of Transmission Mechanism of Pig Price Fluctuations in China. Chinese Rural Economy (7):31-41.

Biography

Fang Wang is a Professor in Sichuan Agricultural University, has rich experiences in agriculture circular economy, both theoretically and practically. She devoted herself for the development of agricultural circular economy in Southwest of China in her years of teaching and research.

f.wang1@uu.nl