

JOINT EVENT

12<sup>th</sup> World Congress on **Biofuels and Bioenergy**  
&  
13<sup>th</sup> Global Summit and Expo on **Biomass and Bioenergy**  
September 04-06, 2018 | Zurich, Switzerland

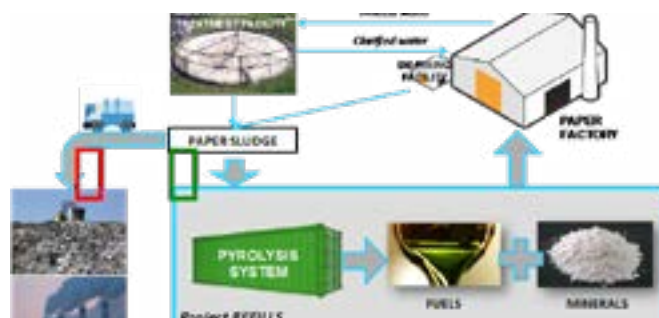


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### Energy and Materials from Biomass Pyrolysis

Flash pyrolysis is a thermochemical process to convert carbonaceous materials into oil, gas and char. Examples of carbonaceous materials are biomass and waste streams. Unfortunately, the quality of the present pyrolysis oil from biomass is not good enough for the existing infrastructure. There are in general two catalytic routes to improve the oil quality: deoxygenation or hydrogenation. Deoxygenation will remove the oxygenated compounds from the oil but unfortunately with the removal of oxygen also carbon is removed and thus the oil yield will be reduced. Via hydrogenation additional hydrogen has to be added to improve the oil properties. However, because of the ample presence of oxygen in pyrolysis oil a lot of water is formed and moreover expensive and mostly fossil hydrogen is required. A new idea presented here is aiming at a high-quality oil by simultaneously in-situ catalytic deoxygenation and hydrogenation. A next step is the application of flash pyrolysis for the production of both energy (biofuels) and materials. One example is paper sludge consisting of paper fibres and minerals. After drying and flash pyrolysis, the fibres in the paper sludge are transformed into oil and flammable gas and the minerals can be used as a raw material for the paper industry. Moreover, the paper industry can avoid dumping of this waste stream. This process of transforming biomass into fuels and minerals is very promising for all kind of residues such as sewage sludge, manure, packaging material or waste streams. More examples will be given during the presentation.



### Recent Publications

1. Imran, A., Bramer, E.A., Seshan, K. & Brem, G. 2016, "Catalytic flash pyrolysis of oil-impregnated-wood and jatropha cake using sodium based catalysts", *Journal of Analytical and Applied Pyrolysis*, vol. 117, pp. 236-246.
2. Yukananto, R., Louwes, A.C., Bramer, E.A. & Brem, G. 2016, "Direct and standard injection of sewage sludge in a supercritical gasification system: Optimization of the energy efficiency using pinch analysis", *European Biomass Conference and Exhibition Proceedings*, pp. 538.
3. Naqvi, S.R., Prabhakara, H.M., Bramer, E.A., Dierkes, W., Akkerman, R. & Brem, G. 2018, "A critical review on recycling of end-of-life carbon fibre/glass fibre reinforced composites waste using pyrolysis towards a circular economy", *Resources, Conservation and Recycling*, vol. 136, pp. 118-129

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4. Imran, A., Bramer, E.A., Seshan, K. & Brem, G. 2014, "High quality bio-oil from catalytic flash pyrolysis of lignocellulosic biomass over alumina-supported sodium carbonate", Fuel Processing Technology, vol. 127, pp. 72-79.
5. Sallevelt, J.L.H.P., Gudde, J.E.P., Pozarlik, A.K. & Brem, G. 2014, "The impact of spray quality on the combustion of a viscous biofuel in a micro gas turbine", Applied Energy, vol. 132, pp. 575-585

### Biography

Gerrit Brem is a professor in Energy Technology and chairman of the Thermal and Fluid department at the University of Twente (NL). He is an expert in the field of thermal conversion processes. For 30 years he was a senior scientist at TNO and in 2009 appointed as a Senior Research Fellow. He has carried out a large number of research and development projects for national and international clients and developed new advanced conversion technologies and demonstrated in practice. He has written over 120 scientific publications and has several patents on his name.

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