

PARTNER PROFILE

BERG within EBRI at Aston University - UK

The Bioenergy Research Group (BERG) within the European Bioenergy Research Institute (EBRI) at Aston University is one of the best established academic bioenergy research groups in the world. Our novel developments have led us to become one of the world's leading university laboratories in thermal biomass processing. BERG's interdisciplinary team of researchers come from a wide variety of backgrounds including chemical, mechanical and aerospace engineering, chemistry, physics, environmental studies and business studies.

Research focus

The focus of our research is fast pyrolysis which converts solid biomass into a valuable liquid energy carrier or fuel known as bio-oil that can be directly used for heat, power and chemicals and can be readily upgraded into higher value 2nd generation biofuels, and chemicals. There is complementary work on gasification, biomass pre-treatment, product upgrading, characterisation and analysis, chemicals production, system design, and technical and economic evaluation.

Thermal processing facilities

BERG has coordinated 15 European Framework projects, and also led the UK national centre of excellence in bioenergy and biofuels – SUPERGEN Bioenergy II, which completed at the end of 2011. The IEA Bioenergy Task 34 for Pyrolysis was created and led by Aston from 1992 until 2008. As a result of its steady stream of national and international funding, EBRI has built up some of the most comprehensive university-based thermal processing facilities and capabilities in the world. These include extensive thermal processing facilities for fast pyrolysis, analysis, CFD and process modelling.

BRISK activities

BERG will be sharing its laboratory facilities and knowledge in fast pyrolysis with related analytical support. Aston is also contributing its experience of dissemination and communication which will play a crucial role in the project, including the production of newsletters and the [BRISK](#) website.

European Bioenergy Research Institute (EBRI)

Aston University's Bioenergy Research Group is a founder member of [EBRI](#). Our key interests are:



Figure 1: 7 kg/h continuous fast pyrolysis unit.

- Biomass characterisation, preparation and pre-treatment;
- Fast pyrolysis of biomass and waste in continuous fluid bed and ablative reaction systems for bio-oil;
- Gasification of biomass in fixed and fluid beds;
- Analytical techniques for characterisation and evaluation of biomass;
- Characterisation and upgrading of bio-oil from fast pyrolysis;
- Development of applications for bio-oil for heat;
- Production of chemicals such as resin precursors for wood panels, slow release fertilisers and preservatives;
- Hydrocarbon transport fuel production by synthesis from syngas and upgrading of fast pyrolysis liquid;
- Biorefinery design, development and evaluation;
- Techno-economic analysis of bioenergy and biofuels production and biorefineries.

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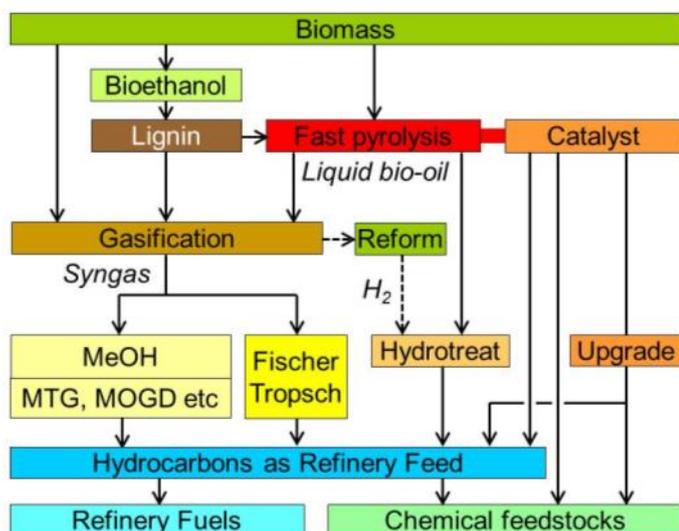


Figure 2: Process routes to hydrocarbons, biofuels and chemicals.

Our laboratory equipment includes:

Biomass preparation and characterisation

- Biomass preparation (Retsch-100 cutting mill and test sieve shaker ELF 2000).
- ASTM characterisation - ash and moisture content analysis (Carbolite AFF1100 muffle oven, Swallow moisture oven, Sartorius moisture analyser MA35).

Analytical pyrolysis (CDS 5200 series pyroprobe system close-coupled with PerkinElmer Clarus 680 GC-MS/FID).

Fast pyrolysis - (4 fluid bed continuous reactors: 150 g/h, 300 g/h, 1 kg/h and 7 kg/h with on-line gas analysis - Varian micro gas chromatograph CP-4900).

Slow pyrolysis - (150 g reactor with on-line gas analysis - Varian micro gas chromatograph CP-4900).

Thermogravimetric analyser (TGA) for thermal properties of biomass and decomposition kinetics (PerkinElmer Pyris 1 Thermogravimetric analyser).

Bio-oil/organic liquids analysis

- Chemical composition and quantification (Varian 450 GC with FID and Varian 220 MS detector).

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- Molecular mass distribution by Gel Permeation Chromatography (Polymer Laboratories PL-GPC system).
- Water content analysis (Mettler Toledo V30 Compact Volumetric KF Titrator).
- Dynamic viscosity (Brookfield LV DV-II-Pro viscometer).
- Headspace analysis of volatile liquids (PerkinElmer TurboMatrix HS-16 coupled with PerkinElmer Clarus 680 GC-MS/FID).

High pressure reactors

- 25 ml autoclave (Parr Instrument Company 4790 Series high-pressure batch reactor).
- 100 ml autoclave (Autoclave Engineers EZE-SEOL high-pressure batch reactor).
- 20 ml high-pressure continuous reactor (Autoclave Engineers BTRS-Jr 5010 reactor) with on-line gas analysis (Varian 450 GC) and two liquid condensation ports.



Figure 3: TGA in operation.

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Contact

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