

PARTNER PROFILE

Aston University Bioenergy Research Group (BERG)

BERG 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

We have 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 us from 1992 until 2008.

As a result of our steady stream of national and international funding we have 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](#).



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

Our key interests include:

- 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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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 pyroprobe system close-coupled with PerkinElmer Clarus 680 GC-MS/FID).

Fast pyrolysis

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

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Slow pyrolysis

(150g reactor with online gas analysis - Varian micro gas chromatograph CP-4900).

Thermogravimetric analyser (TGA) for thermal properties of biomass and decomposition kinetics

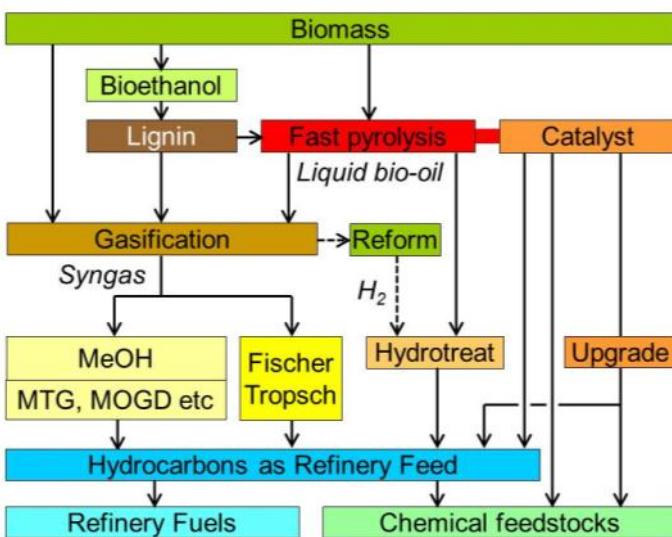


Figure 2: Process routes to hydrocarbon, biofuels and chemicals under evaluation.

(PerkinElmer Pyris 1 thermogravimetric analyser).

Bio-oil/organic liquids analysis

- Chemical composition and quantification (Varian 450 GC with FID and Varian 220 MS detector).
- Molecular mass distribution (Polymer Laboratories PL-GPC gel permeation chromatography system).
- Water content analysis (Mettler Toledo V30 Compact Volumetric KF Titritator).
- 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).



Figure 3: Aston University's nitrogenolysis unit.

High pressure reactors

- 100ml autoclave (Autoclave Engineers EZE-SEOL batch reactor).
- 20ml high pressure continuous reactor (Autoclave Engineers BTRS-Jr 5010 reactor) with online gas analysis (Varian 450 GC) and two liquid condensation ports.



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Contact

For further details about how to apply to utilise Aston University's facilities as part of the BRISK initiative contact:

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