



## **Technology Commercialization Opportunity**

### Modified Pyrolysis Systems for the High-yield Production of Bio-oil from Biomasses

UGARF Case: 1191

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Intellectual Property Status: PCT Publication # 2006119219 A-2. National Phase Applications pending in US and Canada

#### **Introduction**

Biomass, such as forestry and agricultural products and residues, is a major underutilized product in the world. The U.S. Department of Energy estimated that there are over 12 million dry tons of biomass residues generated each year, in the state of Georgia alone, which could be used for energy and chemical production. There are several different technologies for converting the biomass to useful energy (e.g., direct burn, co-firing, gasification, and the like) or to bio-based products (e.g., fermentation, pyrolysis, and the like), in particular bio-oil. Depending on the type of process used, the final product may have different values and applications. In most cases these products replace those generated from crude oil, thus having long-term sustainability and environmental benefits (e.g., being carbon neutral). Bio-oil is a mixture of water, light volatiles, and non-volatiles and is highly reactive because of the presence of significant quantities of oxygen. Therefore, the common method of distillation (as performed with crude oil) for separation of fractions is not effective. During distillation, the oils start boiling below 100°C, accompanied by numerous polymerization reactions, and distillation stops around 250 to 280° C leaving as much as 50% of the starting material. Traditional processes also lead to loss of bio-oil by either superheating effects or poor condensation efficiency, which may also lead to undesirable losses by evaporation and/or biooil degradation and polymerization. Homogeneity of the characteristics of the final product is also hard to achieve from pyrolysis systems. Consequently, the development of methods and processes that increase the yield of production of bio-oil, by optimizing the use of the starting material, provide for better control of the composition of the end product, and improve the biooil separation process is highly desirable with the potential for great economic impact.

#### **Technology Summary**

UGA researchers have developed new processes and embodied these processes in new equipment design, for the optimal production of bio-oils from a variety of cellulosic/lignocellulosic biomasses. These processes involve a new cooling system and process that mitigate bio-oil losses, but also provide for a means to control the composition of the final product (thus leading to products that can be used in different applications) and better control over fractionation, features hard to be achieved from pyrolysis.

#### **Advantages**

- Better control over the composition and characteristics of the final product
- Allow for customization of fractioning of the biomass distillate
- Enables a single setup to be used in conjunction with a plurality of different substrates
- Less-energy demanding than traditional pyrolysis

#### **Potential Applications**

- Production of bio-oils suitable to different applications
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