Improving Biodiesel Production Efficiency via Methyl Ester Recovery

*Methyl Ester Recovery via Microwave-Assisted Pyrolysis*

Microwave-assisted pyrolysis (MAP) maximizes yields by recovering methyl ester from biodiesel vacuum distillation bottoms (VDBs). The technology is a MAP reactor with a fixed-bed heat susceptor silicon carbide (SiC) catalyst that absorbs microwave radiation and quickly achieves a high temperature. The process rapidly heats VDBs, thus avoiding further dimerization and derivatization. After distillation microwave-assisted pyrolysis (dMAP), 85.9% wt/wt of the VDBs were recovered as a transparent bio-oil composed mostly of methyl esters. This bio-oil can be blended back into B100 biodiesel and certified for sale using ASTM D67514. Blending dMAP bio-oil (10% wt/wt) with B100 biodiesel meets all certification requirements and demonstrates that MAP processing could be a significant yield improvement technology for any commercial biodiesel producer.

*Solves Biodiesel Waste Formation Problems and Increases Yield*

Vacuum distillation in commercial-grade biodiesel production is a reliable post-treatment method for removing multiple impurities. However, biodiesel distillation, the most significant and primary purification process, produces a waste stream of VDBs that represents approximately 5-15% of the crude biodiesel. VDBs must either be disposed of or sold as low-grade heating oil for use in boilers or ocean shipping. This new MAP technology recovers valuable methyl esters from VDBs, solving the waste formation problem by recovering a significant amount (approximately 85% wt/wt) of the VDBs as a transparent bio-oil composed mostly of methyl esters. Testing shows the bio-oil can be blended back into the initial distillate stream and that it passes all ASTM D6751 tests required for commercial biodiesel. The process is easily integrated into existing
biodiesel processes and can increase biodiesel yield, resulting in more biodiesel sold than low grade heating fuel.

**BENEFITS AND FEATURES:**

- Up to 10% increase in biodiesel yields for any commercial biodiesel producer
- Decreases waste stream from biodiesel production
- Recovers valuable methyl ester from biodiesel vacuum distillation bottoms (VDBs)
- Employs energy efficient microwave-assisted pyrolysis (MAP)
- Robust, cost effective, fixed-bed heat susceptor silicon carbide (SiC) catalyst
- Minimizes dimerization and derivatization; rapid heating maximizes yield
- Produces biodiesel that passes ASTM D6751 tests when blended into conventional bio-diesel
- High temperatures required for biofuel distillation can be sustained

**APPLICATIONS:**

- Biodiesel production and purification

**Phase of Development** - Proof of Concept

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<td>The University relies on industry partners to scale up technologies to large enough production capacity for commercial purposes. The license is available for this technology and would be for the sale, manufacture or use of products claimed by the issued patents. Please contact Larry Micek to share your business needs and technical interest in this technology and if you are interested in licensing the technology for further research and development.</td>
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