Microbubbles provide new boost for biofuel production

January 26 2012

The technique builds on previous research in which microbubbles were used to improve the way algae is cultivated.

Algae produce an oil which can be processed to create a useful biofuel. Biofuels, made from plant material, are considered an important alternative to fossil fuels and algae, in particular, has the potential to be a very efficient biofuel producer. Until now, however, there has been no cost-effective method of harvesting and removing the water from the algae for it to be processed effectively.

Now, a team led by Professor Will Zimmerman in the Department of Chemical and Process Engineering at the University of Sheffield, believe they have solved the problem. They have developed an inexpensive way of producing microbubbles that can float algae particles to the surface of the water, making harvesting easier, and saving biofuel-producing companies time and money. The research is set to be published in Biotechnology and Bioengineering on 26 January 2012.

Professor Zimmerman and his team won the Moulton Medal, from the Institute of Chemical Engineers, for their earlier work which used the microbubble technology to improve algae production methods, allowing producers to grow crops more rapidly and more densely.

"We thought we had solved the major barrier to biofuel companies processing algae to use as fuel when we used microbubbles to grow the algae more densely," explains Professor Zimmerman.

"It turned out, however, that algae biofuels still couldn't be produced economically, because of the difficulty in harvesting and dewatering the algae. We had to develop a solution to this problem and once again, microbubbles provided a solution."

Microbubbles have been used for flotation before: water purification companies use the process to float out impurities, but it hasn't been done in this context, partly because previous methods have been very expensive.

The system developed by Professor Zimmerman's team uses up to 1000 times less energy to produce the microbubbles and, in addition, the cost of installing the Sheffield microbubble system is predicted to be much less than existing flotation systems.

The next step in the project is to develop a pilot plant to test the system at an industrial scale. Professor Zimmerman is already working with Tata Steel at their site in Scunthorpe using CO2 from their flue-gas stacks and plans to continue this partnership to test the new system.

Dr. Bruce Adderley, Manager of Climate Change Breakthrough Technology at Tata, said, "Professor Zimmerman's microbubble-based technologies are exactly the kind of step-change innovations that we are seeking as a means to address our emissions in the longer term, and we are delighted to have the opportunity to extend our relationship with Will and his team in the next phase of this pioneering research."

More information: The paper, entitled "Microflotation Performance for Algal Separation", by James Hanotu, HC Hemaka Bandulasena, William B Zimmerman is published in *Biotechnology and Bioengineering* on 26 January 2012.

Provided by University of Sheffield