Auckland chemist strikes gold in biogas break through

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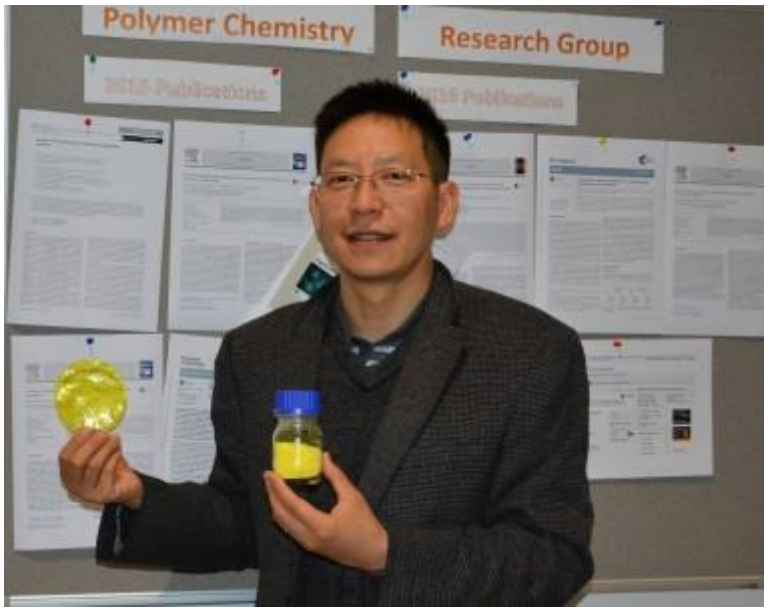
A membrane invented in Auckland and worth more than its weight in gold could drastically change biogas production.



Dr Jianyong Jin with his breakthrough membrane

Dubbed the Golden Polymer by inventor Dr Jianyong Jin because of its colour and value, the film separates methane and carbon dioxide, so the methane can be used for biofuel and the carbon dioxide can be condensed and sequestered.

"By weight, it's more expensive than gold," Jin told Carbon News. "It costs $100 a gram; gold is only $30 a gram."

Currently, most biogas operations in New Zealand are based on municipal landfills, where anaerobic digestion of organic waste produces gas that is burned to generate electricity or heat, releasing carbon dioxide into the atmosphere.

But that's an inefficient use of the gas, says Jin, a senior lecturer in Auckland University's polymer chemistry research group.

Scrubbing process

"Burning biogas is a low-value application," he said. "If you can purify the methane, it's much more valuable, because you can use it as a fuel in your car."

Currently, the only way to separate the methane and carbon dioxide is through a scrubbing process that uses a lot of energy and water.

"The race is on to find a second-generation process to separate the methane and carbon dioxide," said Jin, one of a number of chemists around the world investigating different membranes.

"Using membranes is one method that looks very promising because it's very energy-efficient," he said. "All the other processes, including absorption, are very energy-intensive. In the end it will come down to the process which is the most energy-efficient."

Jin is using a modified version of a polymer called PIM, invented by chemists at the University of Manchester. From it, he's made his Yellow Polymer membrane, a thin plastic sheet that looks like yellow cling-film, which he says is showing great promise because it produces a methane that is 98 per cent pure.

Unlike scrubbing, methane separation can be carbon-neutral, Jin says, because once separated, the carbon dioxide can be liquefied, condensed and stored under ground – raising the future possibility of generating carbon credits.

Radical change

ADI Systems electrical design and commissioning engineer Steve Brewster says that Jin's Yellow Membrane has the potential to radically change the biogas industry in New Zealand, by making small-scale plants viable.

Yellow Membrane has been patented, and Jin and his team have been awarded a grant under the government's Science for Technological Innovation National Science Challenge scheme to enable further testing.

Jin says the money will allow him to employ two PhD students to work with him. He is also working with theoretical chemists at Cambridge University and chemical engineers at the University of Melbourne.

*Carbon credits cannot be generated from the underground storage of carbon under New Zealand's current Emissions Trading Scheme. However, with underground sequestration of carbon increasingly seen as necessary to minimising climate change, that could change in the future.