Egg unboiling machine used to speed up molecule development

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Vortex Fluidic Device creator Prof Colin Raston (right) and lead researcher Joshua Britton. Credit: Flinders University

The machine that unboiled an egg is now being used to develop molecules up to 15 times faster than conventional methods.

Researchers from Flinders University in South Australia in collaboration

with the University of California Irvine have used the Vortex Fluidic Device (VFD) to increase the rate of chemical reactions using enzymes.

Lead researcher Joshua Britton said the research was a potential "game-changer" and could be used to speed up production of chemical molecules for use in fuel and medicines.

"Enzymes make life possible by catalysing diverse and challenging chemical transformations with exquisite precision – and no nasty by-products," Britton said.

"Their use has been limited in some areas, however, because of modest reaction rates, requiring long reaction times and careful optimized conditions. DERA (Deoxyribose-5-phospate), for example, which previously required hours to days, now catalyses 15 times faster using the VFD."

Britton said the new chemical process required only the enzymes, water and a VFD, which made it one of the most environmentally friendly chemical processes.

The VFD was created in 2015 by Flinders University Professor Colin Raston who famously used it to unboil an egg, earning him an Ig Nobel Award.

The device creates a pressure wave that affects how enzymes respond and speeds up the rate of reaction to develop molecules essential for the manufacture of products ranging from medicines to biodiesel.

Enzymes are inserted into the VFD along with water and are rotated through the body of the machine. The rotation speed of the device is variable and is matched to the requirements of specific enzymes.

The water, which is a benign solvent, helps to eliminate waste that is a bi-product of chemical reactions.

Professor Colin Raston said developing technologies that used enzymes to create molecules minimised waste and addressed a "big issue".

"What we have done is established this new paradigm so you can come up with these complex molecules that would have taken a long time in the laboratory using the old paradigm but you can now do it in a fraction of the time," he said.

"If you can make complex molecules using enzymes then you are reducing the footprint on the planet."

Earlier this year, Professor Raston and fellow Flinders University researchers also adapted the VFD to precisely cut carbon nanotubes used in cancer drug delivery.

More information: Joshua Britton et al. Accelerating Enzymatic Catalysis Using Vortex Fluidics, *Angewandte Chemie International Edition* (2016). DOI: 10.1002/anie.201604014

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