Organic Data Storage: Going Beyond DNA

Posted on Wednesday, May 22, 2019

It's been less than three months after Microsoft announced they had developed a cost-effective DNA read/write platform, but scientists are already looking at its successor. Researchers at Harvard University have unveiled details about a new organic data storage technique that may offer even greater capacity per square inch.

As with DNA, this new technique relies on protein molecules. Instead of full-size DNA strands however, Harvard has been using much smaller protein particles called oligopeptides.

Weight as a digital switch

The new data system uses a thin metal plate that has been perforated with 384 microscopic holes called a microwell. Each hole is then filled with a series of oligopeptides, each of which has a slightly different weight. The storage platform accepts a standard binary input and adjusts the microwell content to match. Heavy oligopeptides sink to the bottom, lighter ones float to the top.

When run through a mass spectrometer, the floating molecules are detected, resulting in a value of 1. The heavier molecules sink to the bottom of the microwell where they go undetected, resulting in a value of 0. The resulting binary code is then translated to decode the snippet of information stored in the microwell.

Big potential, limited reality

The current microwell set up is capable of storing 1 byte of information using justeight microscopic oligopeptides; 32 of the proteins will hold 4 bytes, and so on.

To date, researchers have managed to read and write just 400KB of data- a handful of images and the text of a Richard Feynman lecture. And they hope to achieve much more as the technique is refined.

There is one significant problem, however: the oligopeptides system is capable of writing just 8 *bits* per second, and reading a similarly uninspiring 20 bits per second. Worse still, they have only managed a maximum of 99.9% accuracy from data retrieval.

Another 'time will tell' experiment

Despite knowing the natural capacity and potential of DNA data storage, many scientists were skeptical about its use for computing. However recent advances have made the technology look more than theoretically viable, particularly as the medium can now be used outside the lab.

And the same may be true of oligopeptides. In their current state there is no way that these micro proteins are anywhere near production readiness. But as the technique is refined and improved, we may have discovered another medium capable of easy-to-store, ultra-high capacity data storage.