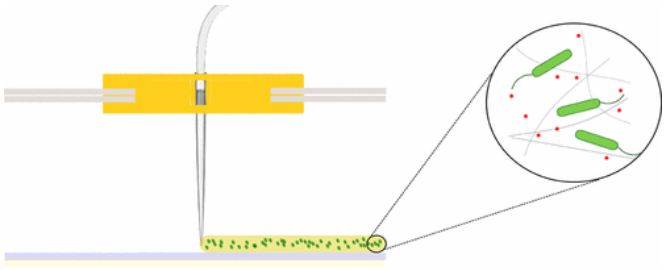
Creating materials in a novel way by 3-D printing bacteria

24 March 2017, by Bob Yirka



Credit: ACS

(Phys.org)—A team of researchers at Delft University of Technology has developed a means for 3-D printing a gel containing bacteria onto a base to create materials in a novel way. In their paper published in the journal *ACS Synthetic Biology*, the team describes their technique and how they used it to simulate a process for creating small graphene samples.

Bacteria has been used for a long time to create chemicals such as antibiotics, and more recently, bacteria have been found to reduce graphene oxide to graphene—the super-material that has so many scientists excited about its potential. In this new effort, the researchers have found a way to use an ordinary 3-D printer to print bacteria containing material onto a base, which allows it to be used in unique ways.

To 3-D print bacteria, the researchers modified an off-the-shelf 3-D printer, removing its heating element (most 3-D printers work by melting the ink which hardens quickly after being ejected from a nozzle). They mixed bacteria with a gel and used it as their ink, which they printed onto an object where it solidified due to interactions with a material on its surface.

To test their technique, the team used E. coli and a gel made from algae as an ink. The ink was printed onto a dish partly covered with calcium ions, which caused the gel to solidify without killing the bacteria. The experiment suggested that it should be possible to use the gel to place graphene-reducing, 1 millimeter-wide lines of Shewanella oneidensis bacteria in a solid form onto a surface containing graphene oxide, thus creating tiny pathways of graphene. S. oneidensis had previously been found to reduce graphene oxide to graphene—a way to make graphene without using chemicals.

The researchers believe their printing technique could have other applications as well, including creating mother-of-pearl teeth, making plaque that causes tooth decay for research purposes, building materials using moon dust, or creating micro-lenses used in cameras or solar panels by emulating some animals that can make bioglass. They note also that because it can be done using inexpensive equipment, it opens the door to a huge number of science, technology and industrial applications.

More information: Benjamin A. E. Lehner et al. A Straightforward Approach for 3D Bacterial Printing, *ACS Synthetic Biology* (2017). DOI: 10.1021/acssynbio.6b00395

Abstract

Sustainable and personally tailored materials production is an emerging challenge to society. Living organisms can produce and pattern an extraordinarily wide range of different molecules in a sustainable way. These natural systems offer an abundant source of inspiration for the development of new environmentally friendly materials production techniques. In this paper, we describe the first steps toward the 3-dimensional printing of bacterial cultures for materials production and patterning. This methodology combines the capability of bacteria to form new materials with the reproducibility and tailored approach of 3D printing systems. For this purpose, a commercial 3D printer

was modified for bacterial systems, and new alginate-based bioink chemistry was developed. Printing temperature, printhead speed, and bioink extrusion rate were all adapted and customized to maximize bacterial health and spatial resolution of printed structures. Our combination of 3D printing technology with biological systems enables a sustainable approach for the production of numerous new materials.

APA citation: Creating materials in a novel way by 3-D printing bacteria (2017, March 24) retrieved 24 January 2021 from https://phys.org/news/2017-03-materials-d-bacteria.html