Pacific Northwest
NATIONAL LABORATORY

ArtSea Inks and Material, a bio-derived polymer, is ideal for art, STEM education, and DIY 3-D-printed projects.

ArtSea INKS AND MATERIAL

Novel art media for 2-D and 3-D compositions

BIO-DERIVED POLYMERS FOR FINE DETAILS

From Rembrandt to Picasso, artists have been using the right combination of color and texture to conjure emotive responses. Today, artists have capitalized on the versatility of additive manufacturing, more commonly known as 3-D printing, to create, restore, and modify art. But current 3-D printing processes predominantly use plastic, which requires high heat to melt the media, thereby limiting manual printing. It's also difficult for artists to achieve vibrant coloring and fine detailing. Researchers at Pacific Northwest National Laboratory have invented bio-derived polymers and inks that bridge this gap.

ArtSea Inks and Material are a novel, seaweed-based polymer "doped" with pearlescent mica powder. The mica pigments in the ArtSea Inks serve as chromatic additives that impart color without interfering with the printing and cross-linking of the seaweed polymer material. Ultimately, these new inks and material create a simple approach to 3-D printing and subtractive techniques to create fine details.

TECHNOLOGY FEATURES

- Ideal for 2-D- and 3-D-printed compositions
- Cost-effective and simple method for manual printing
- No need for complex software or hardware maintenance of a 3-D printer
- Amenable to manual 3-D printing and subtractive techniques for fine detail after printing, which is hard to accomplish with plastics
- Mica powders do not affect viscosity of alginate acid, which leads to a dynamic range of pigment loading
- Ideal art media for everyone—from kids, to DIYers, to professional artists

A realistic human brain model 3-D printed and colorized using ArtSea Inks and Material.

LIMITED ONLY BY YOUR IMAGINATION

PNNL's patent-pending ArtSea Inks and Material provide a low-cost, tunable, 2-D and 3-D media for every budding artist—from kids, to DIYers, to professionals.

Current 3-D printing uses plastics, which require an expensive 3-D printer, software, maintenance, and high heat to melt the material so that it can be shaped into structures. Ultimately, this manufacturing process limits the use of plastic in versatile approaches such as manual printing. Manual printing may be ideal for some artists because it can be cost-efficient and simple.

This new media is based on seaweed solutions that are doped with pearlized colored pigments that can be used for manual 2-D and 3-D art. Seaweed extracts contain chemical groups "that serve as handles, binding metal cations, such as calcium, resulting in structures that maintain a robust 2-D or 3-D shape.

The mica pigments used in PNNL's formulations serve as chromatic additives that impart color without interfering with the printing and inks. Because the inks and material are amenable to manual 3-D printing and subtractive techniques, artists can create fine details.

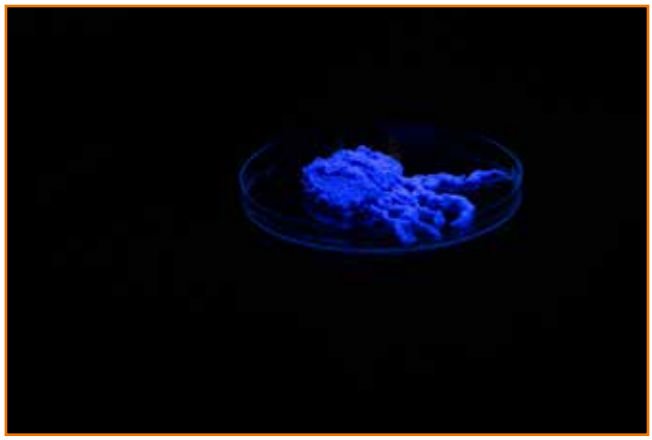
ArtSea Inks can be added throughout the printing process using a nozzle to apply different colors, or the material can be colorized prior to printing.

ArtSea Inks can be formulated to any color, including metallic and pearlescent, as well as glow-in-the-dark inks.

INDUSTRY APPLICATIONS

Seaweed extract is nontoxic, readily available, and inexpensive, thereby making ArtSea Inks and Material an inexpensive media for art suppliers and manufacturers to adopt into consumer products. Inks and materials could be packed and sold independently or as a kit. The novel inventions are ideal for

- Bio-ink for 3-D printed medical models
- Biopolymer for casting molds
- STEAM education
- Additive to commercially available 2-D art media, including powders and water-based paints
- DIY 3-D printing with printers and manually by hand.



An artist's composition using glow-in-the-dark ArtSea Inks and Material.

AVAILABLE FOR LICENSING

PNNL currently is looking for an art supplier or manufacturer interested in licensing ArtSea Inks and Material.

LET'S CONNECT

If you have questions, regarding this technology, please send inquiries to commercialization@pnnl.gov. You can view all PNNL technologies available for licensing at www.pnnl.gov/available-technologies.