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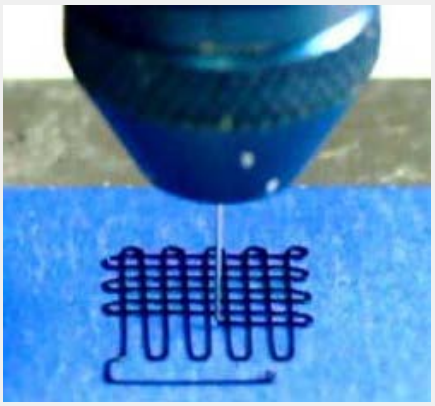
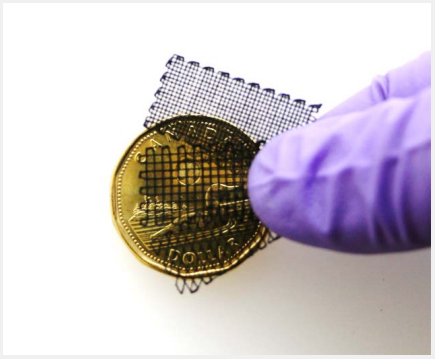
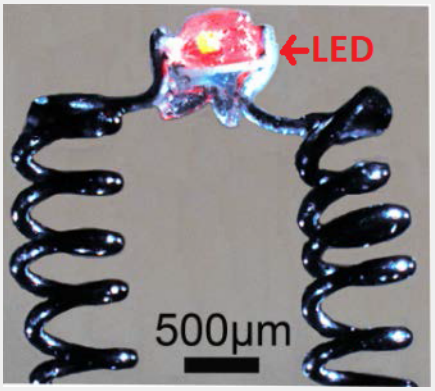
Highly conductive inks for 3D printing







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Background

3D printing of conductive materials has been always a challenge since the most frequently used conductive materials are metals. To overcome this issue, the addition of nanoparticles to a host polymeric material very often leads to significant improvements in material properties (e.g., mechanical, electrical, thermal) at relatively small loadings-size. For instance, addition of carbon nanotubes (CNT) into PLA allow the polymer conductivity (almost insignificant naturally) to increase sharply. However, increasing the concentration of CNT in such composites to more than 10 wt.% is challenging due to mixing difficulties. The high viscosity of the mixing materials and difficulties related to the dispersion of CNTs at high concentrations in a solvent hinders extrusion and solution mixing, respectively. On the other hand, the fabrication of highly conductive ink from polymer-based composite inks is highly demanding and hardly accessible due to extrusion mixing difficulties of highly doped nanocomposite inks from fine nozzles. Composite inks with high concentrations of conductive fillers have different viscosity behavior which blocks the printing nozzle in 3D printing methods involving melting and extruding an ink, such as fusion deposition modeling (FDM), which is the most popular method at the moment.

Technology

Professor Therriault and his team have developed a new method in order to overcome the viscosity problem. Carbon nanotubes, well known for their very high conductive properties were dispersed in PLA a polymer particularly used in the 3D industry.This dispersion technology relies on a mixing method often used for fine grinding. This method enables a nanoparticle concentration highly superior to the usual mixing techniques. Thus, the PLA/CNT composite can contain up to 30 wt% nanoparticles and reach a conductivity of about 5 000 S/m.

Application

The main applications are foreseen in electronics, aerospace and telecommunications where the light material is advantageous as long as consumer 3D printing regarding the technology low cost. Being able to synthesize highly conductive inks useful for 3D printing opens the gate for various applications where the conductive structure can be made from a polymer based composite.

Competitive Advantages

- Highly conductive ink (5000 S/m);
- Versatile ink adapted to large industrial fabrication companies and individual 3D printing users;
- Cost effective technique, very easy to implement;
- Room temperature 3D printing process process, quick drying.

Patent

US Patent Application 15/654,094

Next Steps

We are looking for an industrial partner in order to further develop the technology.

Contact

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