جامعة حمد بن خليفة
HAMAD BIN KHALIFA UNIVERSITY
عضو في مؤسسة قطر
Member of Qatar Foundation

HBKU Thematic Research Grant 1st Cycle– Project Highlight

Project Title: 3D printing based on self-assembled molecular building blocks for materials design and bio-applications

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Executive Summary

In this project, we intend to develop a new generation of molecular 3D printing. The approach is based on implementation of molecular self-assembled monolayers (SAMs) as building blocks, where the properties of each layer can be well controlled by molecular selection and by grafting different metallic particles or nanoparticles. The proposed method has competitive advantages over conventional 3D printing methods in terms of materials fabrication and mechanism. The proof-of-concept measurements have already been successfully conducted. The project also enables leveraging assets and expertise of the participating organizations in computer modelling (QEERI), nanofabrication (QEERI), electronics (HBKU) and system engineering (HBKU). Successful completion of the project will enable us to create a functional 3D printer which will have no analogy in the present-day 3D printing market. The result of this project can be a foundation for further improvement of this technology and place this 3D printer to the market. This printer will also be heavily utilized in future research activities in HBKU including material synthesis, high-performance device development, etc.

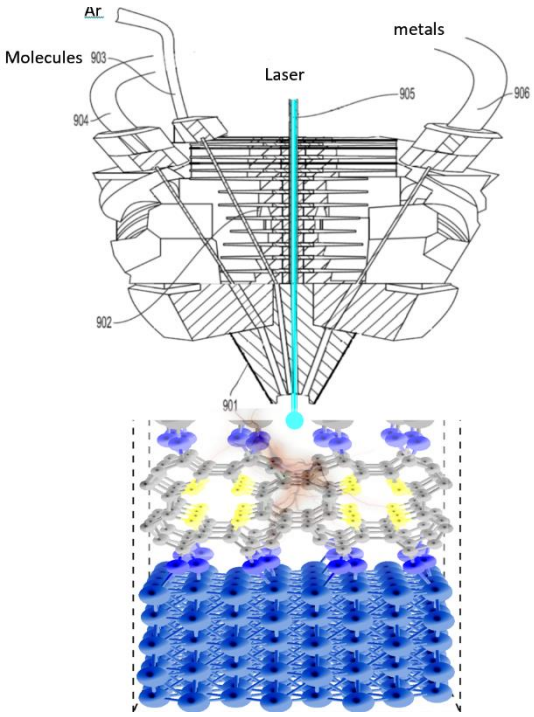
Expected Outcome

The main objective of this project proposal is to develop a prototype of a new generation of molecular 3D printers capable of creating new carbon-based materials and metallic structures with µm-precision. The method is based on implementing self-assembled molecules as building blocks. Different from the typical UV and resin-based printing method, the printer to be developed in this project use laser as the linking energy source with finer resolution. Assisted by a controlled step motor, the laser is placed at the bottom layer for direct excitation instead of the on the side that requires additional optical routing path.

Collaborating HBKU entities:

The College of Science and Engineering, Hamad Bin Khalifa University.

Photos:



Schematics of creating 3D structures using molecular SAM with a Multi orifices extruder.