4D printing: Fabrication of Responsive 3D Objects

Shlomo Magdassi
Casali Center for Applied Chemistry, Institute of Chemistry and Center for Nanoscience and Nanotechnology, The Hebrew University of Jerusalem, Jerusalem, Israel
e-mail: magdassi@mail.huji.ac.il, web page: https://scholars.huji.ac.il/magdassi

ABSTRACT

4D printing is a novel approach that enables a dynamic functionality of printed objects. The objects can change their shape and dimensions in response to time or external triggers such as temperature, humidity, electric and magnetic fields. We will describe various methodologies leading to printed responsive objects and devices, based on inks composed of polymers and monomers with dispersed nanomaterials, such as carbon nanotubes and magnetic particles. The printed objects are obtained by photopolymerization reactions, thus enabling fabrication of films and objects by stereolithography process. For example, we use methacrylated oligomers to print objects with a shape memory behavior, or stretchable polymers while using urethane-based monomers and oligomers. The main printing technology that has been used in this research is the digital light processing (DLP) method, in which the structure is formed by localized photo-polymerization of monomers and oligomers, and by Aerosol-Jet printing. The various inks were utilized for demonstrating fabrication of objects such as dynamic jewelry, components for soft robotics, optoelectronics, and unique drug delivery systems.

REFERENCES


