



Biomedical Engineering Seminar Series

1st Semester, Academic Year 2019

Date: September 24, 2019

Time: 9.30 AM – 10.30 AM

Room 6373, 3rd level, Building 3,
Faculty of Engineering; Mahidol University



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**"Investigation on Novel Metal 3D Printing Methodologies for Dental,
Maxillofacial and Orthopedic Implantology"**

Abstract

Medical implants are temporary or permanent artificial substitutes for body parts, brought into the body for functional, cosmetic, or therapeutic purposes. On a macroscopic level these devices are used to fix or replace a bone and to support its healing process. Various biocompatible materials are used to make the implants ranging from Ceramics and Biopolymers to pure metals and alloys. The selection of material depends on various aspects like type and function of part to be replaced or repaired, strength requirements etc. These implants are basically made by traditional manufacturing process like casting and machining operations, but for the custom-made implants which are manufactured by AM process as well as by powder metallurgy techniques that are time consuming and less versatile. However, if precise fitting is not ensured the patient may still experience some postoperative difficulties and hence result in additional requirements for rehabilitation or even corrective surgery. Thus there is huge need gap of a proper manufacturing method which can address the patient to patient variations in the geometry and size of these implants and produce the implants in minimum time using less processes.

Additive manufacturing (AM) or 3D Printing is a set of disruptive manufacturing methods with fast growing technology developments and applications. Most of the early applications of the technologies were for rapid prototyping. Recent advancements and technology adaptations are on to make it possible to use the methods for commercial applications, biomedical applications is one among the prominent areas. Ceramic and metal biomedical implants used today can be manufactured using 3D printing technologies. It is possible that advanced manufacturing processes could replace the machining or casting of metal and its alloys in the manufacture of devices as well as implants because of several advantages. Two new novel metal 3D printing methods – 1. Metal Clay Printing and 2. Thin-wire Weld Deposition Printing are proposed here. Primary concept validation of MCP is conducted. Experimental identification of the various parameters affecting the process, its impacts on the process and final product are to be determined. The process and equipment can be then optimized by Machine Learning Algorithms using the experimental data.

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