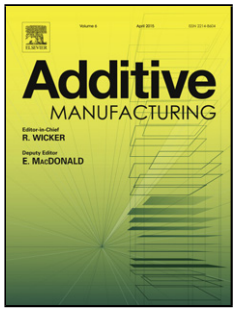

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Binder jetting of a complex-shaped metal partial denture framework

Amir Mostafaei [a], Erica L. Stevens [a], John J. Ference [b], David E. Schmidt [a], Markus Chmielus [a,*]

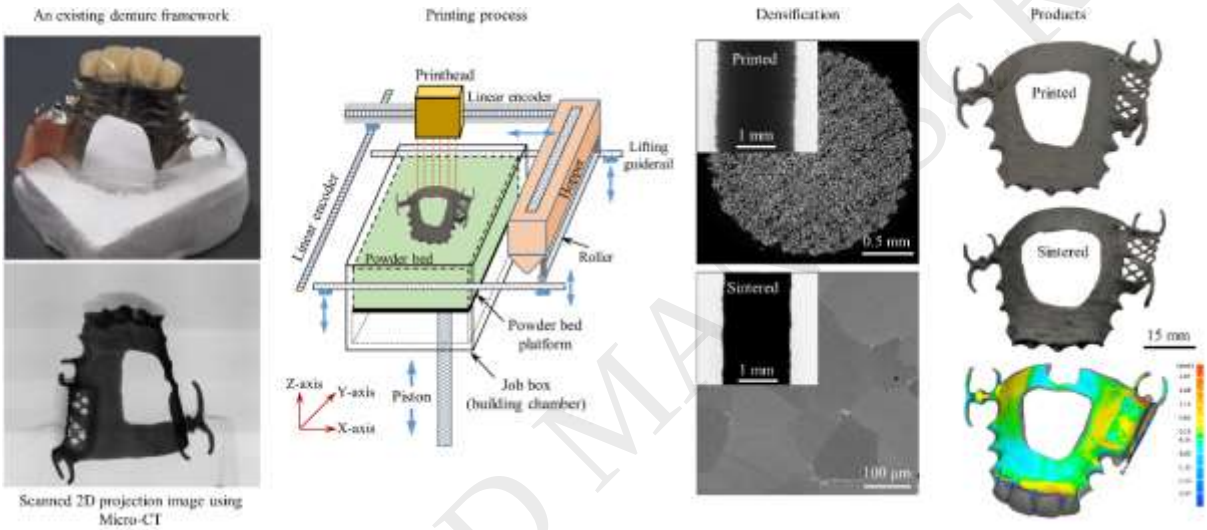
[a] Department of Mechanical Engineering and Materials Science, University of Pittsburgh, Pittsburgh, PA 15261, USA

[b] Department of Prosthodontics, School of Dental Medicine, University of Pittsburgh, Pittsburgh, PA 15261, USA

* Corresponding author

Email addresses: amir.mostafaei@pitt.edu (A. Mostafaei), chmielus@pitt.edu (M. Chmielus)

Graphical Abstract



Abstract

Additive manufacturing provides new chances in the manufacturing of highly complex, mass-customized structures with negligible wastes. Binder jetting holds distinctive promise among additive manufacturing technologies due to its fast, low-cost manufacturing; stress-free structures with complex internal and external geometries; and the isotropic properties of the final printed parts. An ExOne binder jet 3D printer is used to produce frameworks for removable partial dentures from metallic powder. Initially, an existing framework is scanned using micro-computed tomography and then the obtained model is printed. Consolidation of the printed parts is achieved with the relative density higher than 99% density with controlled shrinkage. Presented results demonstrate that binder jetting may be used to produce mechanically sound complex-shaped structures as shown here on a denture metal framework model.

Keywords: Additive manufacturing; Dentistry; Sintering; Micro-computed tomography; Microhardness.

1. Introduction

Additive manufacturing (AM) describes a set of new manufacturing methods, processes and technologies that produce parts through material addition, in contrast to the established traditional subtractive manufacturing methods. Design and printing of complex geometries, waste elimination and recycling of the used materials are merits of AM technology [1]. Rapid prototyping is the most extensive use of AM