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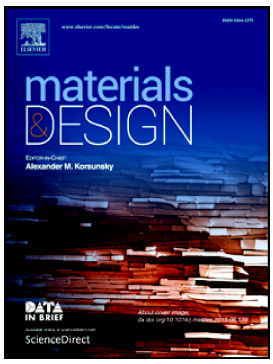

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Guo Jiang, Bai Jiaming, Liu Kui, Wei Jun

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Surface quality improvement of selective laser sintered polyamide 12 by precision grinding and magnetic field-assisted finishing

Guo Jiang[1], Bai Jiaming[1,2] *, Liu Kui[1], Wei Jun[1]

1. Singapore Institute of Manufacturing Technology, 73 Nanyang Drive, Singapore 637662, Singapore
2. Department of Mechanical and Energy Engineering, South University of Science and Technology of China (SUSTC), No. 1088, Xueyuan Road, Shenzhen, Guangdong, 518055, China

Corresponding author: *jiaming_bai@hotmail.com

Abstract

Surface quality is essential for additive manufacture components due to the growing demand in the various industries sections. This paper presents an experimental and analytical study on post-processing of selective laser sintered PA12, aiming at improving the surface quality and clarifying interrelations between surface quality and process parameters. The effects of post-processes on surface and subsurface characteristics regarding material removal, surface morphology and roughness, hardness, tribology performance were quantitatively evaluated. The results show that after post-processing, the surface roughness of the PA12 components were reduced obviously from over 15 μm *Ra* to 2.85 μm *Ra* and 0.89 μm *Ra* by precision grinding and magnetic field-assisted finishing (MFAF), respectively. The un-melted powder surface layer caused was effectively removed although the surface hardness was slightly reduced. The MFAF processed surface showed a better tribology performance represented by lower coefficient of fiction and higher wear resistance. Moreover, the results of laser Raman analysis and X-ray photoelectron spectroscopy (XPS) indicated that there were no obvious chemical changes induced on the sub-surface level within 10 μm by the post-processes.

Keywords： polyamide 12; post-processing; selective laser sintering; surface and subsurface quality; precision grinding; magnetic field-assisted finishing

1. Introduction

Additive manufacturing (AM) or 3D printing, is about building components layer upon layer to achieve predefined geometry directly [1]. Powder based Additive Manufacturing processes, such as selective laser sintering (SLS) [2, 3], selective laser melting [4], electron beam melting [5], laser engineered net shaping [6] have been widely utilised by industries