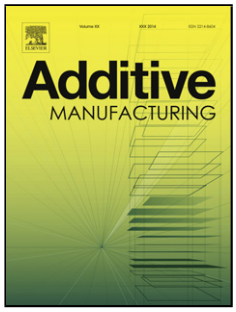

Title: High Speed Sintering: Assessing the Influence of Print Density on Microstructure and Mechanical Properties of Nylon Parts

Author: Adam Ellis Christopher J. Noble Neil Hopkinson

PII: S2214-8604(14)00005-0
DOI: http://dx.doi.org/doi:10.1016/j.addma.2014.07.003
Reference: ADDMA 4

To appear in:

Received date: 6-5-2014
Revised date: 5-6-2014
Accepted date: 22-7-2014

Please cite this article as: <doi>http://dx.doi.org/10.1016/j.addma.2014.07.003</doi>

High Speed Sintering: Assessing the Influence of Print Density on Microstructure and Mechanical Properties of Nylon Parts

Adam Ellis,[*a] Christopher J Noble,[a] & Neil Hopkinson,[a]

[a]Department of Mechanical Engineering, The University of Sheffield, Sheffield, S1 3JD, UK.

[*]Corresponding author: adam.ellis@sheffield.ac.uk

Abstract

High Speed Sintering is a novel additive manufacturing technology that functions by inkjet deposition of a radiation absorbing material directly on to the powder surface followed by the infrared irradiation of the entire build surface. The area deposited with radiation absorbing material absorbs significantly more energy than areas without, sufficient to cause the powder to sinter. Mechanical properties are known to be related to crystallinity, however, no work to date has yet been performed to investigate the relationship between print densities, how this influences crystallinity and the resulting mechanical performance. Dithered patterns were used to vary print density, part crystallinity analysed by Differential Scanning Calorimetry and mechanical properties evaluated by tensile testing. Results showed crystallinity decreased as print density increased. This was reflected by mechanical properties which showed stiffness and tensile strength increased with crystallinity at the expense of ductility. Moreover, High Speed Sintered parts show comparable crystallinity to Laser Sintering indicating the radiation absorbing material has little effect on part microstructure.

Keywords: High Speed Sintering; crystallinity; mechanical properties