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# TUNING MATERIAL TRANSPORTING PROPERTIES WITH MULTI-PHASE INTERNAL STRUCTURES

HP INC

# Tuning Material Transporting Properties with Multi-Phase Internal Structures

Material transporting applications, such as filtration, absorption, venting, wicking and diffusion, are very important in modern industry. The transporting media are usually porous structures manufactured with powder, fibers, and foam materials. Sintering is the most common process to produce transporting media with powder, where the powder particles are heated or compressed to form a solid mass of porous material without melted to the point of liquefaction. The resulting porous materials have isotropic and uniform interconnecting pores. The process also offers a unique combination of functionality and structural strength. However, the sintering process can only be implemented by molding methods. As a result, the boundary geometry is limited. In addition, multi-porosity in one object is not possible.

A method of tuning material transporting properties with multi-phase internal structures is proposed. The principle of the proposed method is that, the porous media are manufactured by powder bed-based 3D printing processes, such as Multi-Jet Fusion (MJF) and Selective Laser Sintering (SLS). Because of the voxel-level control capability of these processes, the sintered material is able to have multiple phases (multiple porosities) in one object. Moreover, the 3D printing process is able to form any part geometry and any internal structure. As result, unique material transporting properties of the porous media can be produced.

As an example, the length of a filtration channel can be extended with a two-phase structure printed by MJF. The cross-section of the structure is shown in Figure 1. The pore size of the filtration media is determined by the size of the powder particles and the degree of solidification, such as degree of fusion in MJF. The degree of fusion can be locally controlled by the density of the fusing agent and/or the amount of fusing energy.

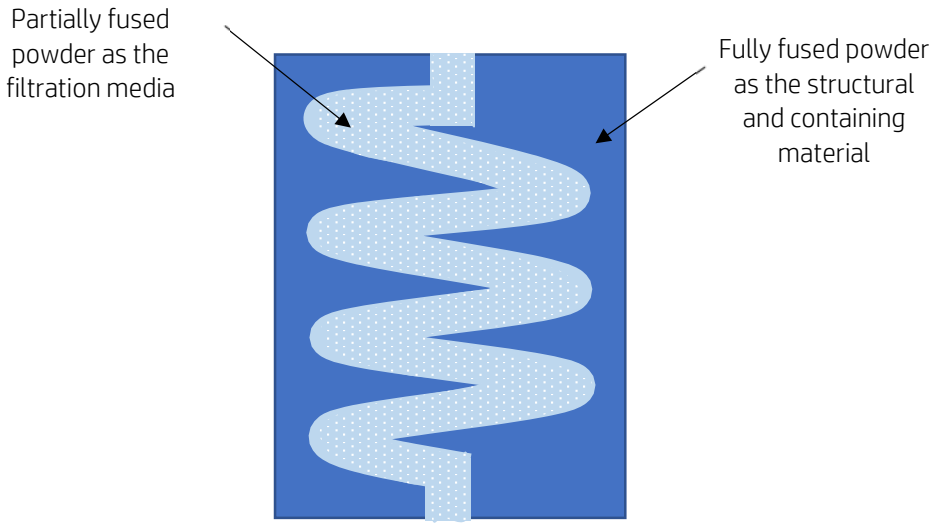


Figure 1. An example of extending the filtration channel with a two-phase structure printed by MJF

***Disclosed by Wei Huang, Gary Dispoto, HP Inc.***