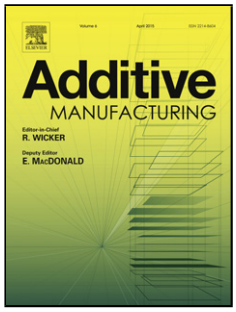

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The Effect of Powder Recycling on the Mechanical Properties and Microstructure of Electron Beam Melted Ti-6Al-4V specimens

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Highlights

- Recyclability of Ti-6Al-4V powder by EBM process has been investigated.
- The effect of powder recycling was explored using metallographic and mechanical testing.
- Recycling causes various defects to appear in Ti-6Al-4V powder, having a negative effect
- on the EBM process.
- HIP significantly improves the quality of the samples made from recycled powder.

ABSTRACT

Additive manufacturing (AM), also called 3D-printing, is an innovative technology, as the printing of objects is performed by layer-by-layer deposition. A wide variety of materials can be used to produce a variety of shapes that cannot be achieved using any other technology. AM started as a prototyping in plastics, and now it is successfully implemented with metals. AM in metals, first of all, in Titanium alloys, offers the potential to not only generate net-shape, complex geometrical and light-weight objects, but also to achieve enhanced mechanical properties, even better than achieved by traditional mass production, like casting.
However, the priority of achieving good non-porous microstructure and the desired mechanical properties is a challenge for the main fields of applications of Titanium AM, such as the aerospace industry and production of medical implants. Thus, the quality of the powder and standardization of the AM process are the top priority. The potential recycling of the Ti-6Al-4V powder as an inextricable part of the AM process needs to be explored.
The influence of powder recycling on Ti-6Al-4V additive manufacturing, the correct number of cycles, the requirements of the recycling procedures, and possible post processing procedures –