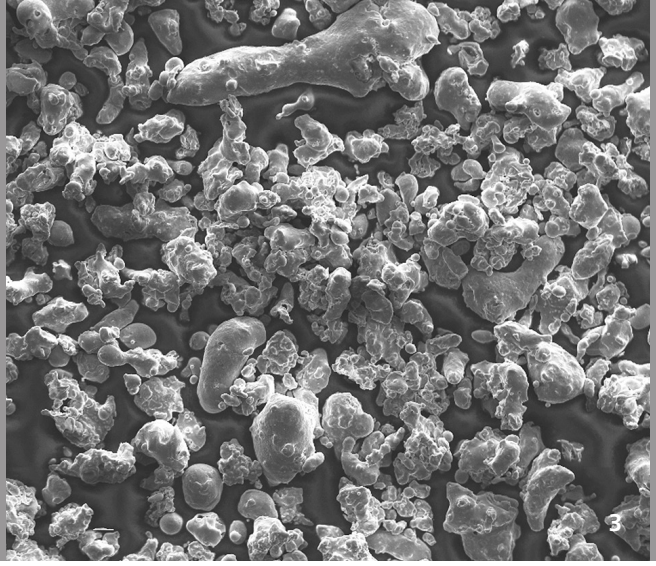

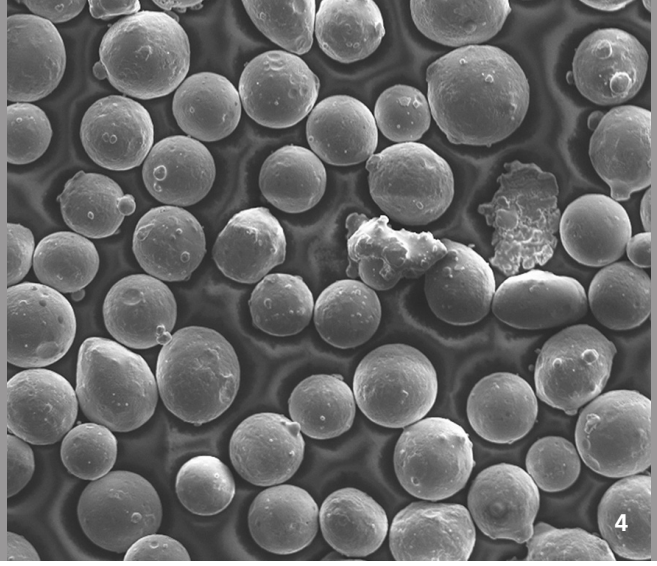

INVESTIGATIONS FOR THE USE OF »LOW-COST« POWDER IN LASER POWDER BED FUSION

Task

In laser powder bed fusion (LPBF), components are produced by layer-by-layer remelting of starting material in powder form. The share of powder costs in component costs, however, will increase for future plant concepts that have significantly increased productivity. Therefore, research is investigating how low-cost powder can be used in the LPBF process. The powder characteristics (e.g. sphericity, grain size distribution) are largely determined by the powder manufacturing process. By default, gas-atomized powder is used because its higher sphericity makes it easier to process.

Method

Fraunhofer ILT is investigating how well standard powder and low-cost powder can be processed with LPBF using stainless steel 1.4404 as an example. For this purpose, two powder batches (water-atomized and gas-atomized) are first analyzed and compared in terms of powder characteristics, such as flowability or morphology. Subsequently, the materials are processed with the same process parameters on a commercially available system and the resulting component density and surface roughness of the as-built specimens are analyzed. Finally, tensile tests are made and the two types of powder are then compared.

Results

For both starting powders, the institute showed that the powders could be successfully processed, resulting in component densities > 99.5 percent. Despite distinct differences in the powder characteristics, especially in terms of flowability, no influence was found on the process window, the process stability and the resulting mechanical properties of tensile specimens. The resulting surface roughness has tended to show that the processing of water-atomized powder results in a rougher surface due to the different particle morphology.

Applications

The findings show that standard powder can be replaced by low-cost powder without having to accept a disadvantage in terms of the resulting characteristic values of the components. For industrial applications, for example, the »low-cost« powder can be used to produce components particularly cheaply, which is of particular interest to the automotive industry.

Contact

Christian Weiß M.Sc.
Telephone +49 241 8906-608
christian.weiss@ilt.fraunhofer.de

3,4 SEM images of gas- (right) and water-atomized (left) powder made of stainless steel 1.4404.

Subject to alterations in specifications and other technical information. 06/2019.