Selective laser melting process with localized substitution of materials

Technologie-Lizenz-Büro
der Baden-Württembergischen Hochschulen GmbH

A newly developed selective laser melting process allows materials to be selectively added to a base material without having to fill the powder bed with the more expensive material. This enables the cost-effective construction of components from different metallic materials with optimized functionalities, high surface quality and gradual material transitions.

- Precise and fast application of optimized materials in a powder bed process
- Progressive material transitions without a mixer in the feeder
- Economical use of expensive additives
- Short production time
- Powder bed material ≠ construction material
- High surface quality without post-treatment with slag formers

Fields of application

Production of metallic composite materials or components from different metallic materials with locally optimized functionalities or material gradients and high surface quality using the powder bed process. The powder bed material can be selected independently of the construction material.

Contact

Dr.-Ing. Hubert Siller
Technologie-Lizenz-Büro (TLB)
Ettlinger Straße 25
76137 Karlsruhe | Germany
Phone +49 721-79004-0
siller@tlb.de | www.tlb.de

Development Status

TRL1 - Idea

Patent Situation

DE 102017106722 pending
EP 3381593 (Unitary Patent) granted

Reference ID

16/064TLB

Service

Technologie-Lizenz-Büro GmbH has been entrusted with exploiting this technology and assisting companies in obtaining licenses.

Background

Additive manufacturing technology revolutionizes the manufacturing process. It offers completely new possibilities, and the flexible concept will become established in series production in the long term, as complex geometries and internal structures can be realized directly, enabling innovative, material-saving designs. Today, components must be designed to be as energy efficient as possible - the trend is toward composite and hybrid construction. So more and more work combinatorial processes with different materials come into focus.

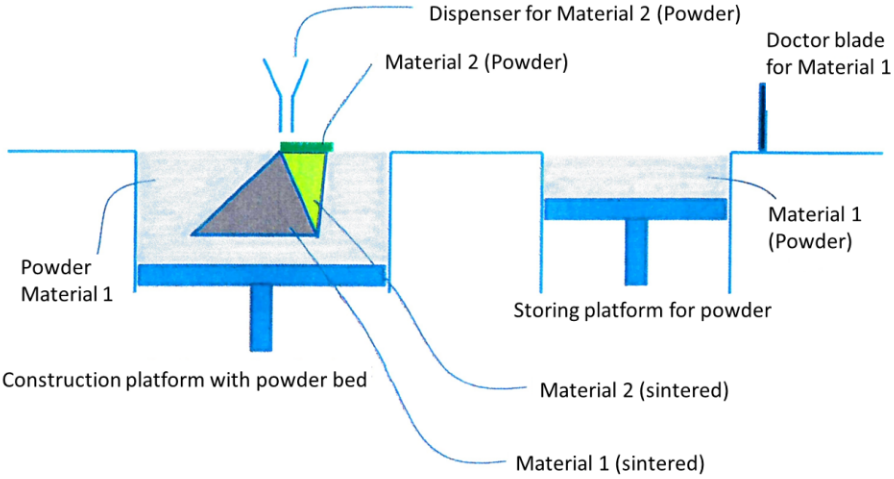
Problem

Additive processes are not new at all. Laser melting has been used successfully in metal processing for several decades. However, it still needs to be optimized. For example, it is not yet possible to economically produce components from different materials since complex dosing systems are required. However, since functional parts of a component are often made of particularly expensive materials, a process that allows additional materials to be combined locally with a cheaper base material is highly desirable.

Solution

Just such a process has now been developed at the Institute for Materials Testing, Materials Science and Strength at the University of Stuttgart. It allows the selective insertion of functional metallic substrate into a base material without having to fill the powder bed with the more expensive functional substrate.

The new process offers two options for selectively replacing the base material with one or more filling materials. This can be done before the next layer is applied by applying material selectively and fixing it locally. Alternatively, after the new layer has been applied, it would also be possible to selectively remove the base material that has not yet solidified using a gas jet, laser or mechanically and replace it with the second material. In this way, components can be constructed from different metallic substrate, which are provided with optimized functionalities in certain areas. Components with a particularly high surface quality can also be produced cost-effectively, as the bed material can be selected independently of the construction material. In addition to the production of components with material gradients through the targeted mixing of materials during application, the material mix also makes it possible to generate specific residual stresses in a component through appropriate heat post-treatment.



Drawing of a possible setup with blade for material 1 and dosing unit for material 2 [M. Werz, Institute for Materials Testing, Materials Science and Strength, University of Stuttgart]