

Expanded infrastructure for the LPBF of high-performance materials

Fraunhofer ILT expands LPBF infrastructure

Since it can produce components of almost any geometric complexity, the additive manufacturing process laser powder bed fusion (LPBF) is increasingly being used in numerous branches of industry. Thanks to its unique process conditions, LPBF is also being investigated as an alternative manufacturing route for components made from various high-performance materials. Many of these materials contain alloying elements that can be hazardous to human health, especially in the powder form required for LPBF. As part of the project "Additive Manufacturing of cutting tools made of tungsten carbide-cobalt (AM of WC-Co)," Fraunhofer ILT therefore comprehensively expanded its infrastructure in order to safely research such materials.

Unique technical features

Among several safety measures, the centerpiece is a room-in-room facility the institute installed in its laboratories. In this facility, a permanent negative pressure and a personnel airlock prevent material hazardous to human health from leaving the room. The extracted air is filtered via several HEPA filter stages with a filtration efficiency of 99.995 percent. These technical measures are supplemented by personal protective equipment

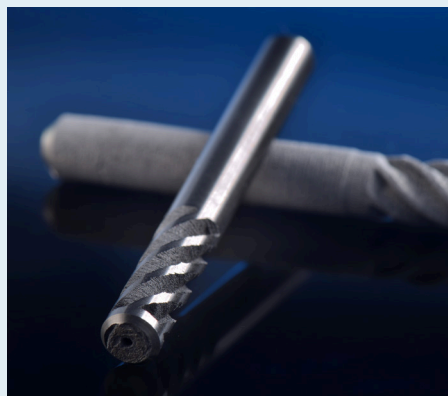
with active respiratory filter devices and regular toxicological screening for all employees working in the room. The modular LPBF laboratory system provides the greatest possible flexibility for testing cobalt-containing hard metals and other materials hazardous to human health in powder form. For example, the LPBF system was equipped with various preheating systems that enable a process temperature $> 900\text{ }^{\circ}\text{C}$.

LPBF from WC-Co carbide

This infrastructure was used to successfully manufacture cutting tools with internal cooling channels made of WC-Co as part of the "AM of WC-Co" project.

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*Author: Andreas Vogelpoth M. Sc.,
andreas.vogelpoth@ilt.fraunhofer.de*



*1 Room-in-room solution in the LPBF laboratories of Fraunhofer ILT.
2 LPBF manufactured cutting tool blanks made of WC12-Co.*