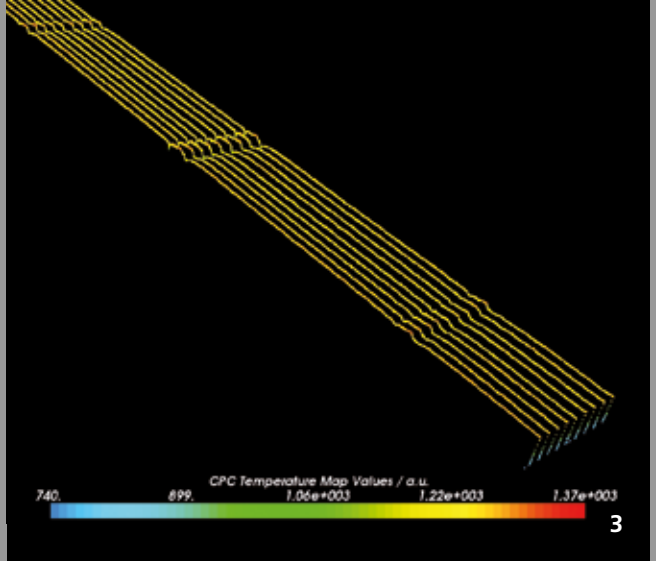

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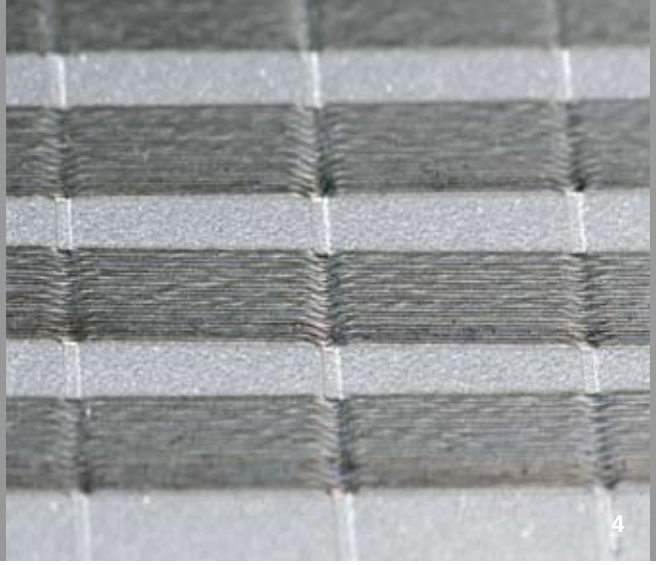
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SPATIALLY RESOLVED HIGH SPEED PYROMETRY FOR SELECTIVE LASER MELTING

Task

In the production of individual components, additive manufacturing processes are becoming more and more important. They allow products with geometric properties to be manufactured, products which can differ from component to component without generating extra costs. Thanks to the process Selective Laser Melting (SLM), component parts can be constructed layer-by-layer through the selective melting of the basic working material from a powder bed. The quality of the manufactured component part results, above all, when the process operates trouble-free. This is determined essentially by process temperature, which results from the interaction of the laser with the powder bed.

Method

In a typical SLM system, a scanner system is used to position the laser beam inside the construction space according to the component geometry. The powder is melted by laser radiation, thereby generating a melt pool whose emitted heat radiation can be detected.

A high speed pyrometer is coupled coaxially with the scanning system, thus allowing the process emission to be detected in situ. In the process, the radiation emitted from the melt pool is guided along the same optical path as the processing radiation via the scanning mirrors to the pyrometer. From the correlation of the measurement to the location of the emission, a »map« can be created, which reflects the course of the temperature.

Result

The process sensor technology implemented allows temperature maps to be recorded during processing, which correlate the respective emission of the molten pool to the point of processing. At typical recording rates of 100 kHz, spatial resolutions result which are less than the diameter of the laser focus, even at high scanning speeds. This enables the process temperature to be monitored almost completely and serves to track the course of the process. By means of suitable signal processing, a great deal of information about the course of the process can be gained based on these data.

Applications

The system can be used for process control in additive manufacturing of component parts that are generated by means of laser radiation from a powder bed.

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3 Emission map.

4 Inconel sample with powder coat.