

Influences, challenges and possibilities of coaxial melt pool monitoring in laser powder bed fusion

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Additive Manufacturing of metal parts by laser powder bed fusion is applied in industry for prototyping, special machine building and aftermarket applications. The serial production of functional parts is profitable if function integration, assembly cost reduction, life-time extension with high performance material application or lightweight design is realizable [1]. Quality assurance measures can be applied layerwise during the additive manufacturing process. Besides off-axis-approaches [2,3,4] the usage of coaxial melt pool monitoring has potential to detect process flaws with a high spatial and temporal resolution [5,6] for multi laser systems. Here we report about influences and challenges regarding melt pool monitoring with a commercial system using a CMOS camera and a photodiode operating at 15 and 40 kHz respectively. This includes positional, directional and powder batch dependencies. Possibilities for detection of surface roughness [7], spatter, porosity [8], and statistical process analysis are introduced and discussed.

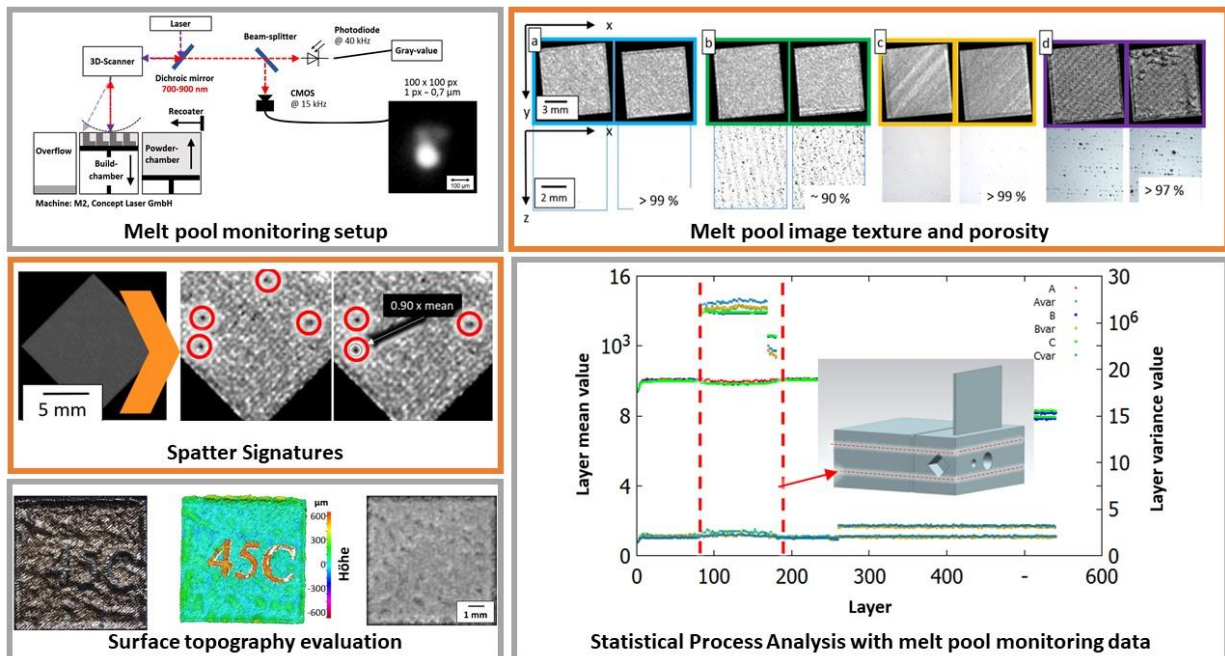


Fig. 1. Setup and usecases for melt pool monitoring in laser powder bed fusion of metal parts.

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