GlobalAM

AMAZEMET

BOSCH

DTU

EurA

UNIKASSEL VERSITÄT MASCHINENBAU

POLITECNICO MILANO 1863

Prima Additive

SAFINA

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GlobalAM
Enabling Laser Powder Bed Fusion for Large Scale Production of Multi-Material Components

Funded by the European Union

Motivation

Conventional metal laser powder bed fusion (LPBF-M) of metals is an established manufacturing technique with great potential in terms of flexibility, digitalization, geometric freedom.
But:
Productivity of LPBF-M is still too low to penetrate mass markets.

Mission

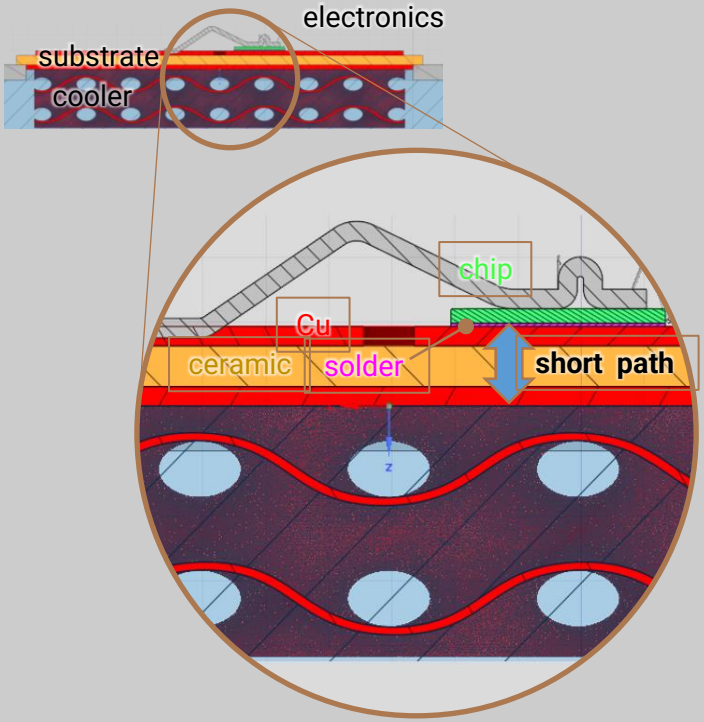
GlobalAM aims to unlock the potential of **additive manufacturing for large scale production** by feature based hybrid production on dissimilar substrate materials.

Approach

A **feature-based hybrid production** where only complex functional components are built on top of conventionally premanufactured substrates **can speed up the production process dramatically** , especially if applied to small component volumes. Given that component and substrate can be joined reliably, at high precision and without introducing defects and given the fact that substrate and component materials can be chosen independently, LBPF-M allows the production of customized components of unmatched geometric complexity for a wide range of mass markets.

Demonstrator

A cooling device for EV inverter power modules is chosen, where cooling structures are printed directly on non-metallic substrates.



Following this approach:

- minimizes the length of the cooling path
- allows an almost unlimited geometric complexity in cooler design
- combines cooler manufacturing + joining
- requires a minimum of material

As a result, a significantly improved cooling efficiency is expected allowing to cut down on chip size and costs.

Key Challenges

Process development and in-line control: Mass production only is possible if quality can be assured throughout. This is especially true for crack-prone substrates. Therefore, simulation-supported process development is combined with in-line process monitoring and defect combination to develop suitable process conditions.

Precise and fast production: LPBF-M on electronic substrates requires µm-scale precision and needs to be integrated into existing production lines with cycle times in the range of minutes.
Therefore, a machine concept is required which allows fast and precise substrate positioning and high productivity.

Material adaption: High-performance products require materials with highly functional properties, also considering ecological and economic aspects.
Therefore, non-standard materials and material modifications are evaluated and optimized to support product optimization.

Key Enabling Technologies

- Process & Defect Monitoring — POLITECNICO MILANO 1863, BOSCH
- Beam Shaping & Splitting — Prima Additive, BOSCH
- Substrate Positioning — Prima Additive
- In-line Defect Compensation — POLITECNICO MILANO 1863, BOSCH
- Substrate Fixation — Prima Additive
- Multi-material Powders — AMAZEMET, SAFINA
- Multi-scale Modelling — DTU
- High Resolution Residual Stress Analysis — UNIKASSEL MASCHINENBAU VERSITÄT
- Exploitation/Dissemination, LCA — EurA