

CSEM SA – Additive Manufacturing and Component Reliability sector

Additive manufacturing of multi-material components

Short description:

CSEM SA focuses on the development of end-to-end additive manufacturing (AM) process for novel mechanism and materials. The development includes powder feedstock qualification, AM process optimization and testing, post-processing development including surface treatments, and quality assurance. Among the AM technologies mastered at CSEM is Laser Powder Bed Fusion (Trumpf TruPrint 1000 and EOS M290) for metals, functionally graded and metal matrix composites and high precision stereolithography (SLA) for polymers and polymer matrix composites.

Since 2018 CSEM SA develops novel hybrid materials using combination of metals with ceramics for improved mechanical properties especially the specific stiffness for lighter structures. Demonstration of improvement by at least 30% in specific stiffness of metal composites has been demonstrated. Besides, CSEM SA has been invested in development of LPBF process towards combination of dissimilar metals and metal alloys to produce functionally graded composites. These unique composite materials and technical capabilities provide tailor-made solutions in design of novel components with improved performances and multifunctional capabilities. Moreover, CSEM currently develops powder-based manufacturing process for ceramic matrix nanocomposites using in-house functional metal nanoparticles synthesis with tailored properties. The main applications of the developed/optimized composite materials could be found especially in space and aerospace industries for design of new lightweight and multifunctional devices.

CSEM possesses state-of-the-art materials characterization and testing laboratory with equipment and strong know-how in investigation of complex materials structure-properties-process relationships. CSEM's research and development activities in advanced manufacturing was previously successfully demonstrated within projects consortia both national (e.g. "ANTICIPATE – Additive NiTi Application for Space Technologies") and international (e.g. "ATOM - Additive manufacturing of metal matrix composites for space application" and "MANUELA – Additive Manufacturing Using Metal Pilot Line").

Partnership / cooperation possibilities:

Our research and technology center is primarily looking for new partnerships with new applications of metal matrix and functionally graded composites (MMC/FGM), which could lead to improvement of specific properties of components while at the same time taking advantage of the design freedom enabled by Additive Manufacturing. Primarily, the advantage is expected through the improvement of (i) specific Young's modulus by at least 30% compared to conventional metal alloys, (ii) improved and/or tailored coefficient of thermal expansion and (iii) multifunctional devices by use of FGM.

Possible H2020 call:

HORIZON-CL4-2022-RESILIENCE-01-12: Functional multi-material components and structures

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