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SLOVENSKI STANDARD
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Aditivna proizvodnja - Konstruiranje - Proizvodnja delov s funkcijsko porazdeljenimi lastnostmi (ISO/ASTM/TR 52912:2020)

Additive manufacturing - Design - Functionally graded additive manufacturing (ISO/ASTM/TR 52912:2020)

Technischer Bericht für die Gestaltung von additiv gefertigten, gradierten Bauteilen (ISO/ASTM/TR 52912:2020)

Fabrication additive - Conception - Fabrication additive à gradient fonctionnel (ISO/ASTM/TR 52912:2020)

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English Version

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Contents

Page

European foreword

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Contents

Page

Foreword

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This document was prepared by ISO/TC 261, *Additive manufacturing*, in cooperation with ASTM F 42, *Additive manufacturing technologies*, on the basis of a partnership agreement between ISO and ASTM International with the aim to create a common set of ISO/ASTM standards on additive manufacturing and in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 438, *Additive manufacturing*, in accordance with the agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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Introduction

Functionally Graded Materials (FGMs) were developed in 1984 for a space plane project to sustain high thermal barriers to overcome the shortcomings of traditional composite materials (AZO Materials, 2002). Traditional composites [Figure 1 a)] are homogeneous mixtures, therefore involving a compromise between the desirable properties of the component materials. Functionally Graded Materials (FGMs) are a class of advanced materials with spatially varying composition over a changing dimension, with corresponding changes in material properties built-in[56]. FGMs attain their multifunctional status by mapping performance requirements to strategies of material structuring and allocation [Figure 1 b)].

The manufacturing processes of conventional FGMs include shot peening, ion implantation, thermal spraying, electrophoretic deposition and chemical vapour deposition. Since additive manufacturing processes builds parts by successive addition of material, they provide the possibility to produce products with Functionally Graded properties, thereby introducing the concept often known as Functionally Graded Additive Manufacturing (FGAM). As this area of work is new, driven by academic research, and lacks available standardisation, there have been multiple different names proposed by different researchers in different publications as terms for this area, for example, functionally graded rapid prototyping (FGRP)[56], varied property rapid prototyping (VPRP)[57] and site-specific properties additive manufacturing[72]. However, even if there clearly is a great need for clarification of key terms associated with FGAM, this document does not include any attempts of alignment in terminology. This document is an overview of state of the art and the possibilities for FGAM enabled by present AM process technology and thus a purely informative document. Since this overview is based on available publications, and in order to facilitate cross referencing from these publications, this document has used the terms concerning FGAM as they are used in the original publications.

a) **Traditional composite** b) **FGM composite**

Figure 1 — Allocation of materials in a traditional composite and an FGM composite

