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Visual measurement of layer thickness in multi-layered functionally graded metal materials

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ABSTRACT

Multi-layered functionally gradient metal materials are formed by metal material deposing with Laser Engineered Net Shaping (LENS) technology. LENS is an additive manufacturing technique that employs a high-power laser as the power source to fuse powdered metals into fully dense three-dimensional structures layer by layer. Layer thickness is an important factor in machining and processing of such advanced materials, as well as in the production, as a feedback to LENS machine operator. Knowing the thickness of the manufactured layer of multi-layered metal material is fundamental for understanding the LENS process and optimizing the machining operations. In this paper, software for visual multi-layered functionally graded material layer thickness measurement is presented. The layer thickness is automatically determined by the software that is programmed in Matlab/Simulink, high-level programming language. The software is using cross-section metallographic images of cladded layers for thickness measuring. Graphic User Interface (GUI) is also created and presented. The results of measurement are presented to demonstrate the efficiency of the developed measurement software.

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Vizualno merjenje debeline sloja večslojnih gradientnih materialov

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POVZETEK

S tehnologijo LENS (angl. Laser Engineered Net Shaping) smo naredili večslojne gradientne kovinske preizkušance. Dodajalna tehnologija LENS omogoča, da s pomočjo laserja velike moči topimo kovinski praškasti izhodiščni material in postopoma, sloj za slojem, ustvarjamo gosto kovinsko strukturo (objekt). Da bi lahko učinkovito izdelovali takšne objekte in jih tudi obdelovali je zelo pomembno, da poznamo debelino slojev. Poznavanje debeline sloja je torej osnova, da bi lahko optimizirali tako LENS postopek nanašanja materiala, kakor tudi nadaljnje obdelave izdelanih objektov. V raziskavi je predstavljena programska oprema za vizualno merjenje debeline sloja gradientnih materialov. Debelina sloja je bila avtomatsko dobljena s pomočjo programske opreme narejene v okolju Matlab/Simulink. Oprema uporablja za merjenje debeline sloja metalografske slike prerezov preizkušancev. V prispevku je predstavljen tudi grafični uporabniški vmesnik. Rezultati merjenja so pokazali učinkovitost predlagane metode.

PODATKI O ČLANKU

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