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VIII ВСЕРОССИЙСКАЯ НАУЧНО-ПРАКТИЧЕСКАЯ КОНФЕРЕНЦИЯ С МЕЖДУНАРОДНЫМ УЧАСТИЕМ, ПОСВЯЩЕННАЯ 50-ЛЕТИЮ ОСНОВАНИЯ ИНСТИТУТА ХИМИИ НЕФТИ

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INVESTIGATION OF DEFORMATION BEHAVIOR OF SLM TI6AL4V SPECIMENS SUBJECTED TO TENSION

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Additive technologies are promising for almost every type of industrial application from civil engineering to aerospace. The benefits include increased productivity, ease of complex shape production and low material consumption. Thus for example in aerospace different conventional parts are being replaced with ones manufactured using SLM-techniques. One of the popular materials for SLM production is Ti6Al4V which provide acceptable mechanical properties. The researchers are constantly trying to improve the performance of the structural materials and in this case it can be achieved using post-processing techniques. Conventional heat treatment and hot isostatic pressing are being used for the present time. Novel techniques to be developed can be based on ultrasonic impact treatment or processing using high energy sources (like plasma or electron beam). In order to assess the mechanical properties and investigate the deformation behavior of developed materials the testing using *in situ* optical and acoustic monitoring is often applied. The paper deals with the investigation of behavior of SLM-manufactured specimens subjected to tension. Digital image correlation using ViC-3D and acoustic emission are used *in situ* to obtain the deformation data and compare it with mechanical properties.

The Ti6Al4V specimens were manufactured by powder bed fusion technique with the height of 70 mm (along z-axis of the printer) and 10x10 mm cross-section. Then the specimens were electro-discharge machined (EDM) to obtain strips with a thickness of ~2 mm which were then subjected to post-processing. Ultrasonic impact treatment (UIT) and electron beam melting (EBM) were used in the study to improve the properties of the SLM manufactured alloy. After the treatment the dog-bone shaped specimens were EDM machined for tensile testing. In order to obtain high contrast surface for DIC the specimens were coated with spray paint speckle. The specimens were tested using electromechanical testing machine Instron 5582 with the strain rate of 0.3 mm/min with *in situ* optical and acoustic emission monitoring.

The obtained data was compared in terms of correlation of deformation data on different stages of straining. The combined plots of σ-ε, acoustic emission count rate and average strain calculated by DIC were constructed and studied. The mechanical properties were measured and the impact of the post-treatment was analyzed and discussed.

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