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Structural integrity of 3D printed billets of titanium alloy Ti-6.5Al-1Mo-1V-2

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This research presents analysis of strength characteristics (tensile and impact) and hardness distribution of titanium alloy Ti-6.5Al-1Mo-1V-2Zr 3D printed elements obtained by electron beam additive manufacturing (EB AM) and cast metal obtained by electron beam cold hearth melting (EBCHM). Compliance of the obtained 3D printed samples with the 3D model geometry was carried out. Dependence of the surface quality of the samples (roughness) and the technological parameters of 3D printing was established. Additionally, a fracture analysis of the samples subjected to static and dynamic loading was conducted, revealing differences in the material behavior between samples produced by EB AM and EBCHM processes. This investigation highlights the critical influence of manufacturing techniques on the structural integrity of titanium alloys.