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Laser powder bed fusion of CuCrZr for nuclear fusion acceleration components

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Copper and copper alloys are widely used in the Nuclear Fusion field for their outstanding characteristics, especially in terms of thermal and electrical conductivities. CuCrZr is peculiarly suitable and well-known in High Energy applications because it combines good conductivity and good mechanical properties. Moreover, the material properties can be tuned with thermal treatments to fit the application requirements even more. Additive manufacturing is then a revolutionizing process that permits the creation of geometrically optimized components. This near-net-shape process allows to produce seamless parts reducing material waste and saving time. We investigate the application of the Laser Powder Bed Fusion technology to produce the acceleration grids of a Neutral Beam Injector.

In this work, the authors analyzed different CuCrZr powders and investigated the material properties obtained after the printing parameters optimization, in as-built conditions and after several heat treatments. The high density and high mechanical and thermal properties allowed us to proceed with the creation of the first prototypes of the acceleration components.

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Footnotes

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Yes

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