## Microstructure And Hardness Of Borides-Containing Layers Obtained By Laser Alloying Of Additively Manufactured 18Ni-300 Maraging Steel Part Surface

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Maraging steels (MSt) are known as a special class of high-strength steels possessing a superior combination of mechanical and technological properties. However, MSt have only moderate hardness and insufficient resistance to abrasion wear, that limits parts longevity and wider application of MSt. Nowadays, MSt are very demanded in a field of additive manufacturing (AM). The present work suggests surface laser alloying to improve hardness of MSt parts manufactured by AM. Concept Laser M3 equipment was used to produce samples from 18Ni-300 MSt powder. For the surface alloying, 1 kW $CO_2$ laser was applied at 0.5–4.0 mm laser spot and 250–1500 mm/min laser operating speed, providing 50955–796 W/cm² power density and 24.0–4.0 J/mm heat input, respectively. Before laser processing, surfaces were covered with amorphous boron paste. For the characterization of obtained layers, optical microscopy, XPS, XRD, and SEM/EDS techniques were applied along with Knoop hardness measurements. The appropriate melt pool geometry was obtained at 0.5 mm laser spot, providing ~84–184 µm melt pool depth. For these samples, XPS analysis revealed an increase in boron concentrations from ~3.1 to ~5.7 wt. % with a laser speed increase from 500 to 1500 mm/min. XRD analysis revealed prevailing of $Fe_3B$ type borides along with the presence of FeB and $Fe_2B$ type borides, austenitic and martensitic phases. The microstructure of laser-boronized layers showed evolution from fine dendritic microstructure, consisting of boride-based eutectic and Fe-based solid solution and having ~630–780 HK0.2 hardness (500 and 750 mm/min laser speed), to superfine lamellar nanoeutectic (~1000–1030 HK0.2; 1000 and 1250 mm/min) and further to submicron-sized grain boride structure (~1770 HK0.2; 1500 mm/min). The obtained hardness was up to three times higher than that of MSt after aging (~600 HK), indicating that laser boronizing technique may be promising in term of the improve of MSt wear resistance.