Influence of HIP on the properties of the LPBF manufactured austenitic ODS steels

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The materials used in nuclear reactors must withstand challenging conditions, such as high temperature and neutron irradiation. Oxide dispersion-strengthened (ODS) steels are promising candidates in that regard, as they exhibit excellent properties in such environment. The most common manufacturing route for ODS steels is powder metallurgy followed by sintering. However, in recent years there has been an increase in interest of producing ODS steels via additive manufacturing. [1]

In this work, 316L steel with addition of 1 wt. % Y_2O_3 with the size of 1-2 µm, was manufactured by laser powder bed fusion (LPBF, AconityMini) and later post-processed by hot isostatic pressing (HIP). To determine the influence of HIP post-process treatment on the properties of the produced materials, the mechanical and corrosion tests were performed. The electrochemical tests were composed of open circuit and potentiodynamic measurements, while mechanical studies included Brinell hardness measurements and tensile tests, alongside small punch creep test. The obtained results were juxtaposed to characterize the properties of 316L ODS steels, before and after HIP, and thus determine the influence of HIP post-treatment on the printed materials.

[1] McGuiness P., Paulin I., Donik C., Dobkowska A., Kubasek J., Pokorny J., and Godec M., *Recent Progress in Oxide-Dispersion-Strengthened (ODS) Alloys Produced By Additive Manufacturing*, „Materiali in Tehnologije", 2025, vol.59, p. 3–10

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