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The role of niobium in improving toughness and corrosion resistance of high speed steel laser hardfacings

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Hardfacing by laser provides a cost-effective option for protecting components against mechanical wear and corrosion. In the present work, high speed steel hardfacings were deposited using a high-power direct diode laser with the aim of investigating the role of niobium content on their mechanical and corrosion properties. The content of niobium was varied between 0.1 and 3 wt.%. The results show that niobium content has a high impact on the hardfacing microstructure and its resulting mechanical properties. In particular, niobium is able to significantly enhance the abrasive wear resistance of high speed steel laser hardfacings. This improvement is accompanied by a superior corrosion resistance. The impact of niobium content on slurry erosion resistance is less remarkable and a clear benefit can only be achieved by microalloying. These results are correlated with the microstructural changes induced by the varying niobium content. An increase in niobium content reduces the amount of carbides found along the grain boundaries, raises the amount of chromium dissolved in the iron matrix and increases the elastic strain to failure of the hardfacing. This results as a consequence in high speed steel laser hardfacings with superior toughness and enhanced corrosion resistance.

Keywords: High speed steel; Niobium; Wear; Toughness; Corrosion.

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