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Microstructure and properties of laser re-melting $FeCoCrNiAl_{0.5}Si_x$ high-entropy alloy coatings

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Abstract

$FeCoCrNiAl_{0.5}Si_x$ (x: molar ratio; x = 0.5, 1.0, 1.5, and 2.0 at. %, respectively) high-entropy alloy (HEA) coatings were synthesized with premixed high-purity Fe, Co, Cr, Ni, Al and Si powder on Q235 steel by using atmospheric plasma spraying and laser re-melting surface alloying, aiming to investigate the effects of different Si molar concentrations on the phase constituents, microstructure evolution, microhardness and properties of HEA coatings. These alloy coatings possessed BCC, FCC and Cr_3Si structures. With the addition of Si, the alloy coatings were BCC and Cr_3Si structures and the volume fraction of BCC ranged from 76.48% to 91.97%. The phase evolution, solid solution strengthening effect and the formation of hard Cr_3Si phase increased the hardness of coatings from 500 HV to 1085 HV with the increase

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