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Nickel-aluminium based anticorrosion coatings prepared by Plasma Spray for high temperature industrial applications

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Key components in energy systems such as gas turbines, power station boilers andfuel engines must surviveaggressive high temperature environments. The combination of high temperatures with the presence of contaminants such as sodium, sulphur and chlorine make hot corrosion one of the main failure modes in these systems. Several strategies to prevent hot corrosion have been implemented. Coatings can provide a shield against corrosion, making possible both the increment of the working temperature and the use of less expensive alloy steels. Due to cost effective deposition and flexibility, plasma spraying has widespread acceptance for anticorrosion coating deposition. [1] Regarding coating material, nickel aluminides have received much attention as prospective operational materials because of their great strength at raised temperatures and brilliant creep properties. [2]In previous works on the plasma spray deposition of nickel aluminides the desired stoichiometry is usually obtained by premixing in the lab pure aluminium and nickel powders using a ball mill or commercial mixed powders are employed.
In this work, a different strategy is followed. A low pressure plasma spray system provided with two sources is employed to deposit intermetallic alloys from pure aluminium and nickel powders, playing with the deposition parameters to obtain different stoichiometry and crystalline structures. The protective properties of obtained coatings in corrosive environment are evaluated.
[1] Sampath, S., Tiwari, R., Gudmundsson, B., Herman, H., "Microstructure and properties of plasma-spray consolidated two-phase nickel aluminides", Scr. Metal. Mater. 25(c), 1425-1430 (1991).
[2] Singh, H., Prakash, S., Puri, D., "Some observations on the high temperature oxidation behaviour of plasma sprayed Ni3Al coatings" Mater. Sci. Eng. A 444(1-2), 242-250 (2007).

Keywords
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