

Title : The corrosion behavior of thermally sprayed double-layer nickel alloy coating produced by arc spraying

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ABSTRACT

This study examined the corrosion behavior of a double-layer nickel thermal spray coating produced via the arc spraying process. The coating featured the same top coating, Inconel 625, but used different bond coats: nickel-chromium and nickel-aluminum. The corrosion behavior was assessed by immersing the coatings in 3 M hydrochloric acid for 1, 3, and 6 days. It was observed that the arc spraying process resulted in similar levels of porosity and oxide formation (for both nickel-chromium and nickel-aluminum as bond coats). In addition, the findings revealed that corrosion occurred along the oxide layer of the coating and at open porosity.

Upon assessing the corrosion rates, the Inconel 625/nickel-chromium coating exhibited a corrosion rate of 2.069 mm/year after exposure for 1 day and 2.467 mm/year after 6 days. In contrast, the Inconel 625/nickel-aluminum coating showed a corrosion rate of 3.072 mm/year after exposure for 1 day and 9.479 mm/year after 6 days. Both coatings demonstrated corrosion rates that increased with exposure time. However, the corrosion rate of the Inconel 625/nickel-aluminum coating was higher than that of the Inconel 625/nickel-chromium coating at

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the same exposure times, indicating that the Inconel 625/nickel-chromium coating offered superior corrosion resistance. This was due mainly to chromium oxides from the nickel-chromium bond coating that prevented permeation of hydrochloric acid and hence lower corrosion rate.

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