CORROSION OF TIO_2-COATED STAINLESS STEELS STUDIED BY ELECTROCHEMICAL TESTS AND NEUTRON ACTIVATION ANALYSIS

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Titanium dioxide (TiO_2) thin films have received much attention due to a combination of attractive engineering properties such as high corrosion resistance, hardness and wear resistance[1]. Enhancement of surface properties is a must-attend issue for metallic components used in nuclear fuel reprocessing plants as the failures associated the use of metallic alloys in this environment is a consequence of surface degradation by corrosion and wear[2]. TiO_2 films could be advantageously applied to protect stainless steels against corrosion in nuclear fuel reprocessing plants. This work aimed at investigating this possibility. TiO_2 films were deposited on AISI 304 stainless steel substrates by metal-organic chemical vapor deposition (MOCVD). The corrosion behavior of the coated specimens was assessed in nitric acid solution at different temperatures using electrochemical impedance spectroscopy and potentiodynamic polarization curves. The presence of metallic ions in the testing solutions was assessed using neutron activation analysis (NAA). The results showed that the corrosion resistance of the stainless steel substrate was significantly improved by the TiO_2 films. Film porosity was considered as a major aspect of the deposition process as it strongly influenced the overall corrosion resistance of the coated specimens. Chemical analysis of the testing solution by NAA pointed that the total amount of released metallic ions was effectively reduced by the TiO_2 films.

REFERENCES

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