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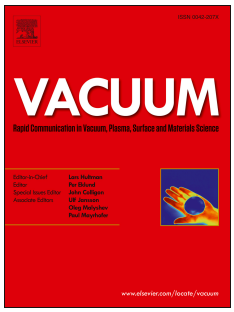

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Abstract:

In this study, the effect of a nitrogen compression plasma flow on the microstructural and mechanical properties, as well as on the elemental and phase compositions of a Zr/chromium–nickel steel system has been investigated. The Zr/steel system was exposed to a single pulse of the compression plasma flow or to a series of pulses. The samples were characterized by scanning electron microscopy, Auger electron spectroscopy, X-ray diffraction, and energy dispersive X-ray analyses, and subjected to a Vickers microhardness test. The findings showed the formation of a surface modified layer alloyed by Zr with the thickness of up to ~12 μm. The modified layer contains α- and γ-iron-based solid solutions, the $Fe_{23}Zr_6$ intermetallic compound, and ZrN and Cr_2N nitrides due to nitrogen diffusion. The microhardness of the modified layer increased by a factor of ~2.

Keywords: compression plasma flow; surface alloying; austenitic steel; zirconium