

## ملخصات الأبحاث المقدمة للترقي باللغة الإنجليزية

### البحث الأول

مشترك - منشور بمجلة دولية ((غير مستخلص من رسالة))

#### عنوان البحث:

Microstructure and mechanical properties of FeCoCrNiAl<sub>0.1</sub>N high entropy alloy nitride coatings synthesized by cathodic arc ion plating using alloy target

التركيب الدقيق والخواص الميكانيكية لطلاءات النيتريد المركب (FeCoCrNiAl<sub>0.1</sub>N) عالية الإنتروبيا المُحضرة بواسطة الترسيب الأيوني بالقوس الكاثودي باستخدام هدف مُسبوك

#### Abstract

To promote the industrial application of high entropy alloy nitride (HEAN) coatings, the cathodic arc ion plating deposition process was explored to deposit FeCoCrNiAl<sub>0.1</sub> N using casting HEA alloy targets. We investigated the impacts of nitrogen pressure and bias voltage on the microstructure, mechanical characteristics, and friction behaviors. X-ray diffraction, scanning electron microscopy, and transmission electron microscopy were used to analyze the microstructures. It was found that compositions for all coatings were uniformly and the coatings mainly consisted of FCC-HEA, CrN, AlN, and FeN phases. The nano hardness and plastic deformation resistance, characterized by nano-indentation, both increased with the nitrogen pressure and certain bias voltage (<150 V). Coating deposited with 2.0 Pa and 150 V presented the maximum hardness of 32.9 GPa and the highest  $H^3/E^2$  value of 0.1 GPa. The hardening mechanism was focused. Coatings deposited with low nitrogen pressure presented better crack resistance under scratch load. The friction behaviors were presented based on the combined studies of friction curves, wear track profiles, and morphologies. FeCoCrNiAl<sub>0.1</sub> N coatings revealed excellent wear resistance with relatively lower COF (ranging from 0.43 to 0.51).

#### الباحثون:

Q. Wan<sup>a</sup>, B.Y. Jia<sup>a</sup>, P. Liu<sup>b</sup>, Y. Luo<sup>a</sup>, J. Chen<sup>c</sup>, X.Y. Zhang<sup>d</sup>, Y.Y. Xiao<sup>a</sup>, Tarek Kh. Abdelkader<sup>e</sup>, Mohamed Refai<sup>f</sup>, J. Zhang<sup>d</sup>, B. Yang<sup>d</sup>

A College of Engineering, Huazhong Agricultural University, Wuhan 430070, China

b Wuhan Jiaofa Ship Design Co., Ltd, Wuhan 430021, China

c Key Laboratory of Metallurgical Equipment and Control Technology, Wuhan University of Science and Technology, Wuhan 430070, China

d School of Power & Mechanical Engineering, Wuhan University, Wuhan 430072, China

e Agricultural Engineering Department, Faculty of Agriculture, Fayoum University, 63514 Fayoum, Egypt

f Agricultural Engineering Department, Faculty of Agriculture, Cairo University, 12613, Giza, Egypt

#### المجلة وتاريخ النشر:

Surface & Coatings Technology) 2023), 457, 129305.

<https://doi.org/10.1016/j.surfcoat.2023.129305>