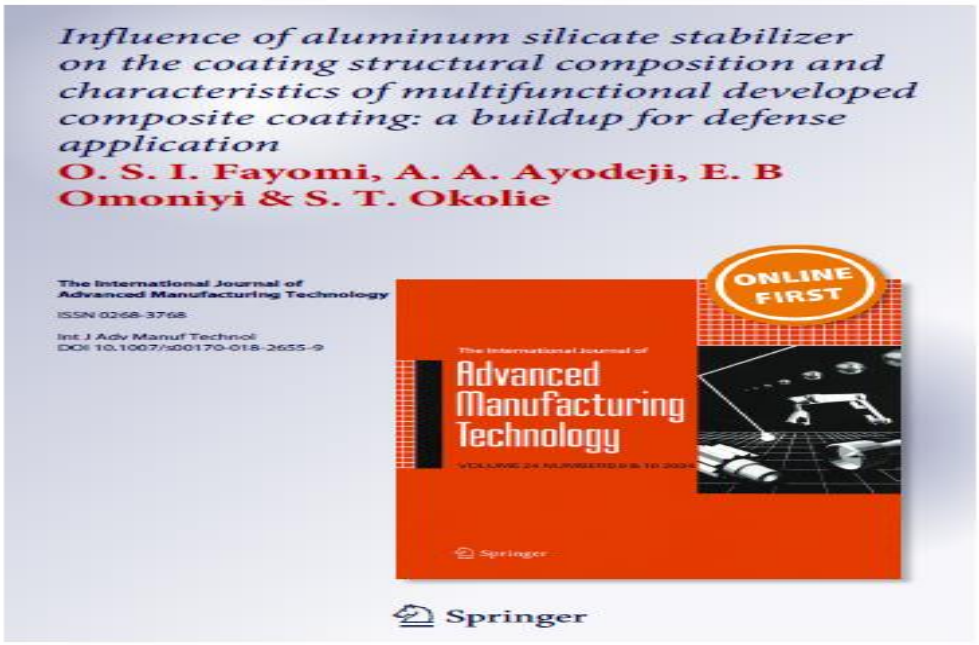

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ORIGINAL ARTICLE

Influence of aluminum silicate stabilizer on the coating structural composition and characteristics of multifunctional developed composite coating: a buildup for defense application

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Abstract

The trajectory challenge of defense component in service is basically as a result of fallout in both structural, plastic deformation, and corrosion vulnerability. In an attempt to address this catastrophic, Zn-SiO_2 composite films were produced on mild steel substrate by electro-deposition route from zinc-based sulfate solutions in the presence $Al_6O_{13}Si_2$ particle. The thin film coating was investigated using scanning electron microscopy coupled with energy dispersive spectroscopy (SEM/EDS). The anti-corrosion behavior in 3.65% NaCl medium was studied using potentiodynamic polarization technique and characterized by high resolution optical microscope (HR-OPM). The wear and the hardness properties of the composite coatings were measured with high diamond microhardness tester and reciprocating sliding tester respectively. Experimental results show that co-deposited $Al_6O_{13}Si_2$ particle provides new orientation of metal matrix and modified the surface structure which contributed maximally to 30% increase in hardness and 40% increase in wear resistance. More so, increase in anti-corrosion property of all the deposits fabricated is attributed to the formation of new surface evolution. This result attested to the fact that this component is suitable for defense application.

Keywords Zn-SiO_2-$Al_6O_{13}Si_2$ · Composite coatings · Thin films · Tribology · Corrosion