

Thick nitride coatings deposited by supercritical fluid chemical deposition as hard chromium alternative

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Over decades, chromium had been widely used in many industries to provide wear- and corrosion-resistant coatings. Nowadays, the use of chromium is widely monitored and regulated (EU REACH Regulation 1907/2006). The present work concerns the development of a new sustainable and efficient technology for the deposition of thick coatings to replace hard chrome. This technology is the supercritical fluid chemical deposition (SFCD) process. TaN and TiN coatings were proposed as an alternative to hard chrome coatings because of their compatibility with various metallic substrates as well as for their good hardness, wear and corrosion properties.

Thick TiN and TaN protective coatings were deposited on steel substrates by SFCD process using anhydrous hexane (C_6H_{14}) and ammonia (NH_3) as an alternative to vacuum coatings (PVD and CVD).

The link between deposition parameters, microstructure and properties of the deposited films was studied. Films were characterized in terms of XRD analysis, adhesion to the substrate, hardness, roughness, wear and corrosion resistance. This work reports high growth rate deposition of TiN and TaN coatings by SFCD using TDMAT and TBTDET as precursors, respectively.

