

ELECTRODEPOSITION OF TERNARY Cr-CeO₂/La₂O₃ NANO-COMPOSITE FROM ENVIRONMENTALLY FRIENDLY Cr(III) BATH AND THEIR PROPERTIES

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One of the possible methods of to improvement of properties of thin Cr coatings is the formation of nano-composites. Various nanoparticles (Al₂O₃, TiO₂, ZrO₂, SiC, WC, B₄C, AlN, WS₂, MoS₂, CeO₂, etc.) are used for this purpose. Lanthanoids have been of great interest because they make it possible to enhance functional physical and mechanical properties of materials.

For the first time the Cr-CeO₂/La₂O₃ composite has been electrochemically deposited in a sulfate Cr (III) bath with an oxalate complexing agent. The XRD analysis revealed that incorporation of CeO₂/La₂O₃ particles into the Cr matrix does not change its state and Cr matrix remains fine-crystalline (crystallites size < 1nm). The cross-section SEM and EDS analysis confirmed incorporation of CeO₂/La₂O₃ particles (about 13 wt. %) into the Cr matrix. The studies of the mechanical properties of the Cr-CeO₂/La₂O₃ composite have shown that the hardness of the composite increases due to CeO₂/La₂O₃ particles incorporation, while both the friction coefficient and wear rate decrease. The mechanism of CeO₂/La₂O₃ nanoparticles incorporation into the Cr matrix has been discussed.