
**Metallic and other inorganic
coatings — Electrodeposited nickel-
ceramics composite coatings**

*Revêtements métalliques et autres revêtements inorganiques —
Dépôts électrolytiques composites de nickel-céramique*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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The committee responsible for this document is ISO/TC 107, *Metallic and other inorganic coatings*, Subcommittee SC 3, *Electrodeposited coatings and related finishes*.

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Introduction

Electrolytic codeposition of ceramic particles into the metal matrix is a low-cost and low-temperature method suitable for producing composite coating. Ceramics particles can be hard oxide or carbides like Al_2O_3 , SiC , Si_3N_4 , TiO_2 , WC or diamond. Also, it may include solid lubricants like PTFE, graphite, h-BN or MoS_2 . Incorporation of such particles can improve mechanical, tribological and anti-corrosion properties of electrodeposited coatings. Nickel being an engineering material, nickel-ceramics composite coating can find wide application such as cutting tools for semiconductors, heat exchangers, automobile shackle pin, glass moulds. The applications cover machine elements, tools, electronics, micro-system technology, electrochemistry, acoustics, decoration and many more. In addition, electrodeposited nickel-ceramics composite coating can be applied in automotive parts including cylinder bores, piston and piston rings to increase engine performance. Nickel-based composites exist as many different types depending upon kind of ceramic particles incorporated, which can differ significantly in their properties. To increase hardness and corrosion resistance, hard ceramic particles such as SiC , Si_3N_4 and Al_2O_3 can be used, whereas to increase wear resistance property, mainly self-lubricating solid particles such as h-BN, PTFE or MoS_2 can be used. It is therefore important to choose the right ceramic particles for a given application. Typical solution compositions, operating conditions and mechanical properties of electrodeposits from Watts and nickel sulphamate solutions are given in [Annex B](#).

The objective of this document is to provide processing and requirements that cover all nickel-based composite system. This enables both providers as well as users to easily fabricate the composite system.

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