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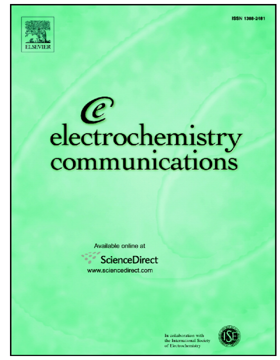


# The electrochemistry of intermetallic compounds: A mini-review

Natalia Ivanova

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**The electrochemistry of intermetallic compounds: A mini-review**

Natalia Ivanova

Department of Analytical and Inorganic Chemistry, Kemerovo State University, 650043 Russia, Kemerovo, Krasnaya, 6, sayga@ngs.ru

**Abstract**

Intermetallic compounds are very promising materials for a range of applications. In this mini-review, the cathodic deposition and anodic oxidation of intermetallic compounds are discussed, and modern approaches to determining the phase composition of metallic systems using electrochemical techniques are considered. The conditions for electrochemical formation of some typical intermetallic compounds in a range of systems in various media are summarized in tabular form.

**Keywords:** alloy, intermetallic compound, electrodeposition, anodic oxidation, phase analysis, voltammetry.

## 1.Introduction

Intermetallic compounds or intermetallides are binary, ternary or polymetallic ordered phases with crystal structures and properties which often differ markedly from those of elemental metals. The main areas of research in the synthesis and electrochemical use of intermetallic compounds (IMCs) are: preparation of catalysts for electrochemical processes such as hydrogen evolution, oxygen reduction, electrooxidation of formic acid, methanol, ethanol and formaldehyde for use in power sources (Pt(Pd)–M (M = Mo, Pb, Fe); Ni–M (M = Fe, W, Cu, Al, Zn); hydrogen-storage alloys for NiMH batteries [1-7]; active electrode materials for Li ion batteries (Sn–M) [8, 9]; shape memory and corrosion-resisting materials (TiNi); supermagnetics (Fe, Co, Ni)Pt; and composite materials for electronics and jewellery (AuM). Anodic oxidation of the IMCs $Ni_3Al$, FeAl, $Ti_xAl_y$, CuZn is used to produce nanostructured metals and their oxides [10-12].

The replacement of an individual metal or solid-solution type of alloy by an IMC is carried out to impart some particular property to the material concerned, e.g. in case of Li ion battery electrodes, the crystal structure distortion during lithiation is minimised, corrosion resistance and catalytic activity can be increased and the costs of noble-metal-containing catalysts may be reduced.

In electrochemical analysis using voltammetric methods, IMCs are formed by design for the dual purpose of suppression during co-deposition (Hg-, Bi-electrodes) and registration of analytical signals of non-oxidizing/reducing elements (As, Se, Pt, Te, Hg, Mn) [13-15], i.e. for their determination at required concentrations. IMC-based electrochemical sensors are also utilized for the catalytic determination of biologically active substances, for example, glucose and ascorbic acid [16-17].

As well as developing solutions to applied problems such as those described above, it is also important to study the fundamental kinetics and mechanisms of cathodic deposition and anodic oxidation of IMCs.