INSTITUT JEAN LAMOUR

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Séminaire de László PETER

Wigner Research Centre for Physics

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Salle 6, bât. ICPM, Metz Technopôle

In-depth component distribution of electrodeposited alloys and multilayers

The importance of electrodeposited metals, multilayers and nanostructures keeps growing due to various properties of technical relevance. In parallel, an immense improvement of the composition depth profiling methods took place in the last decades, hence allowing a depth resolution of about one nanometer.

In order to exploit the opportunity offered by these up-to-date instruments, a large variety of electrodeposited alloys and multilayers have been studied. The composition depth profiles to be presented were performed with either Secondary Neutral Mass Spectrometry (SNMS) or Glow Discharge – Time-of-Flight Mass Spectrometry (GD-ToFMS), while elemental maps were also obtained in TEM. For sputtering-based depth profiling methods, the advantage of the application of the reverse depth profiling direction was also taken of, highlighting the composition variations in the near-substrate zone of the deposit.

The general experience was that in stagnant solutions, the preferentially deposited component(s) of the electroplated alloy accumulate in the near-substrate zone as compared to the mean alloy composition achieved during the steady-state deposition. This accumulation trend proved to be independent of either the substrate or the alloying elements. In ternary systems, a correlation between the mole fractions of the preferentially deposited elements was found. The correlation between the mole fraction of the preferentially deposited elements could be confirmed with direct TEM elemental map observations. When the hydrodynamic conditions during the deposition was well controlled, the near-substrate accumulation of the preferentially deposited metals could be suppressed.

For multilayers, the composition depth profiling analysis was helpful for either taking into account the surface roughness in the elucidation of the experimental depth profiles or detecting the correlation between the occurrence of the impurities and one of the main components.

Séminaire organisé par l'équipe Chimie et électrochimie des Matériaux, IJL.