Technology from Kyoto University

Electroplating Method for Medium-Entropy Alloys

We are looking to out-license the technology for its commercialization.

Provides for electroplating of medium entropy alloys that achieve a balance of strength and toughness

◆Background

CrCoNi-based medium-entropy alloys (MEAs) possess high toughness while also exhibiting exceptionally high strength among both high-entropy alloys (HEAs) and MEAs, making them suitable for use in sliding components.

However, due to differences in the redox potentials of their constituent elements, multicomponent alloys are generally considered difficult to deposit as thin films with equiatomic composition by electroplating. In particular, when Cr is included as a constituent element, there is a challenge in that a complex deposition process must be employed, partly due to environmental considerations.

◆Description

Kyoto University researchers have successfully formed thin films of medium-entropy alloys with nearly equiatomic composition by optimizing the electroplating solution and conditions.

✓ **High Flexibility in the Selection of Constituent Elements**

This technology enables electroplating on MEAs containing Cr.

Furthermore, in principle, any combination of elements that can be reduced in an aqueous solution is possible.

✓ **Equiatomic ratio adjustment of constituent elements**

The surface morphology of the thin film obtained by the new electroplating method is relatively smooth, and the constituent elements can be deposited in nearly equiatomic ratios (Fig.1 &.2).

✓ **Rapid Fabrication of MEA Thin Films**

By mixing multiple types of solvents in appropriate ratios in the electroplating solution, multiple types of metal ions can be continuously supplied to the electrode during electroplating, enabling rapid fabrication of MEA thin films.

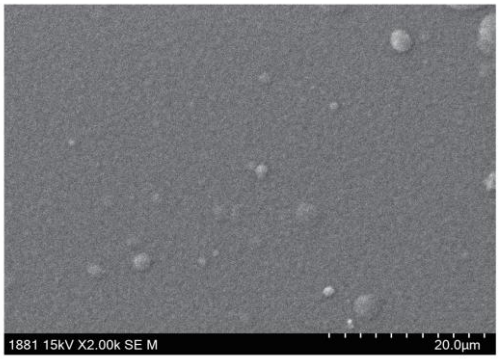

Fig.1 Secondary electron image of the surface of CrCoNi MEA electroplating prepared by the new method

The image shows a smooth film surface with a composition ratio of Cr:Co:Ni = 35:28:37.

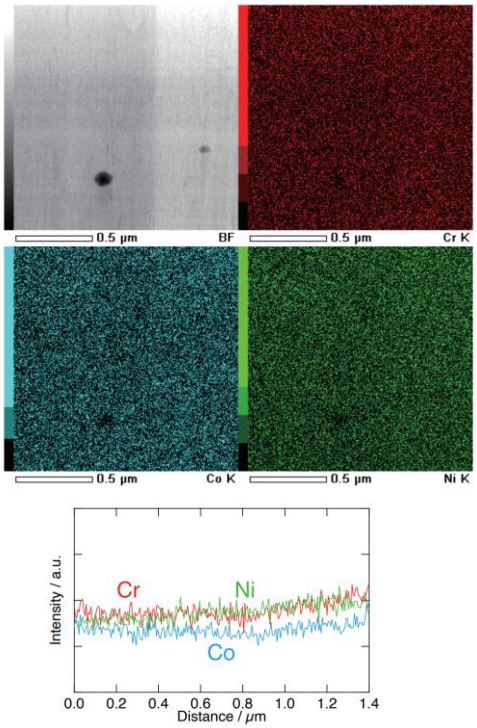

Fig.2 STEM-EDS mapping of the CrCoNi MEA electroplating prepared by the new method

◆Development Status

- CrCoNi-based MEA thin film sample fabricated
- Confirmed both the nearly equiatomic composition and the film thickness

◆Applications

- Ferrous and non-ferrous metals
- Machining

◆Offer

- Patent License
- MTA for sample testing
- Collaborative Research

◆Intellectual Property

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