

# 37 - 34 Electroplating of zirconium and aluminum hydroxide thin films following anodic dissolution of corresponding metal anodes in organic medium

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Zirconium (IV) hydroxide or hydrate oxide films, which are typically difficult to prepare by electrochemical methods using aqueous solutions, are easily fabricated in an acetone bath using Zr anodes as the metal sources and a metal-free solvent containing halide ions as the supporting electrolyte. This method is also confirmed to be applicable to aluminum anodes. In the early stage of electrolysis, anodic oxidation of the metal anode proceeds in the presence of water as an impurity in the solvent. Subsequently, pitting corrosion of the oxide film on the metal anode occurs as a result of the action of halide ions. The corrosiveness of the halogen additive appears to be an important factor determining the dissolution or deposition of metal species in this stage. That is,  $\text{Br}^-$  is more active for electrochemical dissolution of a passive oxide film on the anode compared to  $\text{I}^-$ . Finally, Zr species are deposited on the cathode surface via reactions with cathodically generated hydroxide ions. In these processes, the metal plate acts as a soluble anode and as a metal source for electrodeposition. The coating of Zr (IV) hydroxide film on a stainless steel substrate is shown to act as an effective barrier against electrolytic corrosion.

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