3d-metallic layers electrochemically deposited from nearly nonaquaeous electrolyte

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Electrodeposition of *3d* metallic layers are important technological processes because of wide range applications. Copper electrodeposition known as "damascene process" [1] is used in chip production, cobalt, nickel and iron alloys with soft-magnetic properties have applications in micro-electromechanical systems as magnetic actuators [2]. Most of electrodeposition processes are performed in water solutions where cation concentration is of the order of 1 mole/dm^3. Electrochemical processes of significant technological importance are characterized by uniform layer formation with strong connection to the substrate and small roughness.

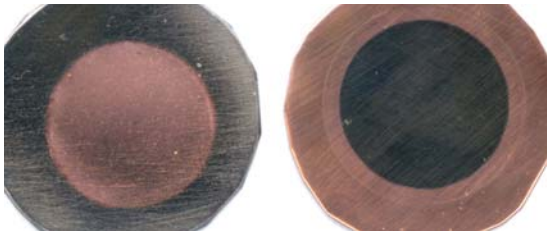

Fig. 1. Cu layer on Fe substrate and Co layer on Cu substrate obtained from nearly nonaqueous electrolyte.

A method of electroplating a shiny layers of Fe, Co, Ni, Cu and Zn from universal type of electrolyte, which at the beginning of the process consists only of dimetyloketon and small amount of water and HCl, is reported. The source of cation is an anode made of the metal which has to be deposited. During first few minutes the anode dissolves, the electrolyte is self-prepared and finally the metallic layer is deposited. The cation concentration during this process is about two orders of magnitude smaller than in aqueous electrolytes. This property is significant from the environmental protection' point of view. All electrochemical processes are performed in DC current mode at room temperature. The layers are well connected to the different cathode substrates and are shiny. Since the electrolyte contains small amount of reactive species, it can be easily managed and removed and thus the layers of thickness of 400 nm can be formed and removed out of the electrolytic cell. Physical properties of the layers are reported.

[1] M. Datta, Electrochim. Acta **48** (2003) 2975
[2] L.J. Gao, P. Ma, K.M. Novogradecz, P.M. Norton, J. Appl. Phys. **81** (1997) 7595

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