Preparation of Perpendicular GdFeCo Magnetic Thin Films with Pulse Electrodeposition Technique Utilizing Molten Salt as Electrolyte

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Z. Naturforsch. **62a,** 761 – 768 (2007); received April 26, 2007

We have utilized $ZnCl_2$-dimethylsulfone ($DMSO_2$) as the electrolyte with added $GdCl_3$, $FeCl_2$, and $CoCl_2$, for electrodepositing a perpendicular GdFeCo magnetic thin film. The reaction at the electrode surface and the electrical conductivity of the ionic substance at different ionic concentrations were studied by cyclic voltammetry and a computerized direct current method. Moreover, the electrodeposition of the GdFeCo thin film was determined by a pulse potential method. Relation between the composition of the deposited thin film and control parameters including applied potentials was determined by EDS analysis. An amorphous structure and the thickness of the thin film were obtained by TEM analysis. Its roughness and uniformity were determined by AFM analysis. Meanwhile, a perpendicular magnetic property and pinning magnetic domain of the thin film were analyzed from results of AGM and MFM.

Key words: $ZnCl_2$-$DMSO_2$ Electrolyte; Perpendicular GdFeCo Magnetic Film; Pulse Potential Method.