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3,073,762
ELECTRODEPOSITION OF COBALT
PHOSPHORUS ALLOYS

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This invention relates to the electrodeposition of hard magnetic coatings and more particularly to the electrodeposition of alloys of cobalt and phosphorus from an ammoniacal bath.

An object of the present invention is to provide an electroplating bath for electrodepositing cobalt-phosphorus alloys from an ammoniacal solution.

A specific object of the instant invention is to provide an electroplating bath for depositing magnetic coatings having coercive forces between 500 and 750 oersteds.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of preferred embodiments of the invention.

In accordance with the present invention, an electroplating bath is provided which produces magnetic coatings suitable for magnetic storage having coercitivities between 500 and 750 oersteds. The bath consists essentially of the following constituents within the ranges indicated:

	Preferred	Optimum
Cobaltous Chloride ($\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$), g./l.	20-30	20
Ammonium Chloride, g./l.	20-200	50
Sodium Potassium Tartrate ($\text{NaKCO}_4\text{H}_4\text{O}_6$), g./l.	30-200	80
Sodium Hypophosphite ($\text{NaH}_2\text{PO}_2 \cdot \text{H}_2\text{O}$), g./l.	50-100	60
pH	7.0-9.0	7.5
Temperature, ° C.	50-80	60

In a typical run, cobalt-phosphorus films are electrodeposited at a current density between 25 and 125 amps. per sq. ft. onto brass substrates. As measured in a 60 cycle B-H loop tester with a drive field of 1000 oersteds, films having the following properties are achieved: coercive forces, 500-750 oersteds, remanence, B_r , above 2000 gauss and squareness ratio, B_r/B_s , between 0.7-0.8.

During the plating, the substrates are agitated at about 300 r.p.m. and the films are deposited for a period of ten minutes to give it a deposit of about 0.1 to 0.5 mils thick. The products are mirror bright, shiny and strong.

As the art will appreciate the purpose for the ammonium chloride in the bath is to increase the conduc-

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tivity of the bath and accordingly, other conductive salts such as KCl and NaCl may be used in place of ammonium chloride. Similarly, complexing agents for cobalt ion other than the tartrate, such as the citrate, perform in a satisfactory manner.

While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A method of electroplating magnetic coatings of cobalt-phosphorus alloys on a substrate which comprises subjecting said substrate to electrolytic action in a plating bath having a pH about 7.0-9.0 containing cobalt ions in the range 4.95-7.45 grams per liter of solution and hypophosphite ions in the range 30.66-61.32 grams per liter of solution at a current density between 25-125 amps. per sq. ft. to produce thereby a magnetic coating having a coercive force at least 500 oersteds, a remanence, B_r , above 2000 gauss and a squareness ratio, B_r/B_s between 0.7-0.8.

2. The method according to claim 1 wherein the plating bath temperature is maintained between 50°-80° C.

3. The method according to claim 1 wherein there is present from 15.4-102 grams per liter of solution of a tartrate ion as a complexing agent.

4. The method according to claim 1 wherein there is present from 20-200 grams per liter of solution ammonium chloride as a conductivity salt.

5. The method of electrodepositing magnetic coatings of cobalt-phosphorus alloys on a substrate which comprises subjecting said substrate to electrolytic action in a plating bath having a pH of about 7.5 containing 4.95 grams per liter of cobalt ions, 36.8 grams per liter of solution of hypophosphite ions, 92.1 grams per liter of solution of tartrate ions and 50 grams per liter of solution of ammonium chloride at a current density between 25-125 amps per sq. ft. said bath being maintained at a temperature of about 60° C. to produce thereby a magnetic coating having a coercive force at least 500 oersteds, a remanence, B_r , above 2000 gauss and a squareness ratio, B_r/B_s , between 0.7-0.8.

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