ELECTRODEPOSITION OF CO-CU ALLOY

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ABSTRACT

THE RELATIONSHIP OF " PROCESSING / MICROSTRUCTURE / MECHANICAL- PROPERTIES " OF THE ELEC -TRODEPOSITED CO-CU ALLOY WAS ESTABLISHED TO ACHIEVE BETTER UNDERSTANDING OF THE MICROSTRU -CTURE AND MECHANICAL PROPERTIES OF THE CO,CU AND CO-CU DEPOSITS PLATED AT VARIOUS CURRENT DENSITIES. 35MM-THICK CO, CU AND CO-CU COATINGS WERE ELECTRODEPOSITED ONTO COPPER PLAT -ES USING DIRECT CURRENT. THE ELECTROPLATING PARAMETERS STUDIED INCLUDE CURRENT DENSITY,EL -ECTROPLATING TIME AND THE TYPE AND EXTENT OF AGITATION.THEN,OPTICAL MICROSCOPY (OM),SCANN -ING ELECTRON MICROSCOPY (SEM) AND TRANSMISSION ELECTRON MICROSCOPY (TEM) WERE USED TO CHA -RACTERIZE THE MICROSTRUCTURE OF THE VARIOUS DEPOSITS,PARTICULARLY THE GRAIN STRUCTURE AND LATTICE DEFECTS.FINALLY,THE HARDNESS OF THE DEPOSIT WAS MEASURED USING A VICKERS HARDNESS TESTER. WHEN AIR WAS PUMPED INTO THE BATH FOR AGITATING THE ELECTROLYTE AND REMOVING THE HYDROGE -N BUBBLES FORMED ON THE CATHODE SURFACE,THE CATHODIC CURRENT EFFICIENCY WAS APPROXIMATELY 10 %.SEM OBSERVATIONS FURTHER IDENTIFIED THE SURFACE OF THE COPPER PLATE WAS DOTTED WITH M -ETAL OXIDE POWDERS. CONVERSELY, WHEN NITROGEN GAS WAS PUMPED INTO THE BATH, THE COATINGS WITH RATHER UNIFORM THICKNESS WERE FREE OF PIN HOLES AND EXHIBITED A LUSTROUS SURFACE.ADDI -TIONALLY, THE CATHODIC EFFICIENCY WAS CLOSE TO 100 %. EXPERIMENTAL RESULTS INDICATE THAT THE HARDNESS OF THE CO-CU ALLOY COULD BE DIVIDED INTO TWO CATEGORIES;THAT IS,THE DEPOSITS PLATED AT CURRENT DENSITIES LESS THAN 2 A/DM2 WAS SOFTER THAN THOSE PLATED AT CURRENT DENS -ITIES EXCEEDING 2 A/DM2.THE MAXIMUM HARDNESS OF THE DEPOSIT WAS APPROXIMATELY 10% HIGHER THAN THE MINIMUM HARDNESS,INDICATING THE CURRENT DENSITY SLIGHTLY AFFECTED THE HARDNESS OF THE DEPOSIT.THE CO-CU ALLOY DEPOSITED AT 0.3~5 A/DM2 EXHIBITED A COLUMNAR GRAIN STRUCTURE. CROSS-SECTIONAL TEM FURTHER REVEALED THAT THE DEPOSITS HAD A BIMODAL GRAIN STRUCTURE,I.E., RELATIVELY-SMALL EQUIAXED GRAINS WERE OCCASIONALLY OBSERVE TO DISPERSE IN THE COARSE COLUM -NAR GRAINS.MOREOVER,WITH INCREASING CURRENT DENSITIES, THE DEFECT DENSITY OF THE DEPOSITS INCREASED AND THEIR RESULTING HARDNESS INCREASED.

Keywords : CO-CU ALLOY, COLUMNAR GRAINS, SEM ,CROSS-SECTIONAL TEM

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