

A világ öntvénytermelése 2012-ben, t

Ország	Lemezgrafitos vasöntvény	Gömbgrafitos vasöntvény	Temperöntvény	Acélöntvény	Rézalapú öntvények	Alumínium-öntvény	Magnézium-öntvény	Cink-öntvény	Egyéb nemvasfém öntvény	Összes
Ausztria	39,700	93,000		17,258		123,865	5,687	12,871		292,381
Belgium	36,500	6,400		31,474		790				75,164
Boszn. Hercegov.	10,942	2,058		4,973		6,905				24,878
Brazília	1,655,903	685,197	19,580	252,020	14,828	225,276	3,649	3,445		2,859,898
Csehország	179,608	52,911	9,240	94,929	5,367	73,165		8,268	870	424,358
Dánia	31,800	47,400			1,273	3,172 ^A			290	83,935
Dél-Afrika	161,000	59,000		118,000	14,300	21,000	300	1,400		375,000
Egyesült Királyság	128,000	191,000	3,300	74,000	10,000	104,500 ^A		8,500	1,000	520,300
Finnország	24,553	38,431		15,637	3,008	3,619		259		85,507
Franciaország	657,700 ^B	675,700		102,200	17,688	324,509		20,064	2,295	1,800,156
Horvátország**	22,107	17,375		1,313	459	11,652		230	661	53,797
India	6,254,000	981,000	60,400	1,158,000		891,000 ^B				9,334,400
Japán	2,209,307	1,377,385	36,558	213,199	79,571	1,399,053		22,981	4,783	5,342,837
Kanada	393,530			95,816	15,142	229,926				734,414
Kína	20,100,000	10,900,000	600,000	5,400,000	750,000	4,450,000 ^A			300,000	42,500,000
Korea	1,062,900	671,500	14,000	160,900	25,800	487,800	12,900 ^C			2,435,800
Lengyelország	486,000	141,000	10,000	51,500	5,500	330,500	3,300	8,000	1,000	1,036,800
Magyarország	49,000	31,000	11	3,535	1,745	96,128	189	4,367	124	186,099
Mexikó*	771,700	58,947		78,746	140,701	600,469	109	1,007		1,651,679
Mongólia***	2,000	220		12,000	60	180			240	14,700
Németország	2,392,654	1,641,528	31,679	217,197	77,330	802,501	16,444	34,772	9	5,214,114
Norvégia	13,400	36,400		3,000		5,575				58,375
Olaszország	626,435	416,805 ^B		72,184	12,727	717,213	6,790	56,846	50,680	1,959,680
Oroszország*	1,857,600	897,840	340,560	731,000	56,760	373,670	33,110	9,460		4,300,000
Pakisztán	200,000	20,000		30,000	15,000	6,000				271,000
Portugália	35,043	73,884		7,982	9,206	18,940		1,027		146,082
Románia	31,669	2,910	637	24,853	4,878	45,795	5,050	20	6	115,818
Spanyolország	328,600	580,700	5,900	76,100	11,760	112,384		8,639	601	1,124,684
Svájc	16,200	29,700		2,000	2,347	17,970		1,235		69,452
Svédország	153,900	51,100		23,400	10,300	37,800	2,600	4,300		283,400
Szerbia	37,251	15,162	10,328	9,050	2,220	4,958			7,528	86,497
Szlovákia*	2,700	18,200		4,100		46,000 ^C				71,000
Szlovénia	100,200	24,900		33,900	1,052	30,065		2,250		192,367
Tajvan	597,495	206,889		76,248	40,175	279,864	5 865	88,606	3,007	1,298,149
Törökország	610,000	502,000	8,000	140,000	14,000	157,000		14,000		1,445,000
Ukraina	420,000	140,000	40,000	530,000	45,000	260,000	20,000	35,000	42,000	1,532,000
USA	4,296,420	4,479,680 ^A	85,280	1,432,530	355,620	1,752,680	110,680	240,400	71,670	12,824,960
Összes	45,995,817	25,167,222	1,275,473	11,299,044	1,743,817	14,051,924	226,673	587,947	486,764	100,834,681

Jelmagyarázat

- A magnéziumöntvényvel együtt
- B összes nemvasfémöntvény
- C cinköntvényvel együtt

Forrás: Giesserei Rundschau, 61. évf. (2014) 1/2. sz.

Összeállította: dr. Lengyel Károly

Török T. – Sós D. – Kun É. – Szabó M. – Haki J. – Csik A. – Kövér L. – Glodán Gy. – Vad K.: Surface finishing thin-film deposition techniques for lead-free tin base soldering 29

Recent environmental and health protection issues induced continuous development of industrial metals and alloys. As a result in car manufacturing, the built-in printed circuit boards (PCBs) applied e.g. in safety and control units, are nowadays mostly produced using lead-free tin soldering technology. The technology requires proper adjustment of the properties of the metallic conducting surfaces. For the purpose of such surface finishing thin metallic layers of nickel, nickel-phosphorus, gold and silver are most often used. Within the framework of the FORR-ÁSZ project this work focuses primarily on the effects of the experimental conditions on the development of thin silver layers deposited onto copper substrates applying contact reductive precipitation. The in-depth concentration distribution of contaminating elements incorporated (partially as a consequence of atomic interdiffusion of copper and silver) were monitored using GD-OES (Glow Discharge Optical Emission Spectrometry) and SNMS (Secondary Neutral Mass Spectrometry).

Csik A. – Takáts V. – Haki J. – Vad K. – Tóth J. – Kövér L. – Török T. – Kaptay Gy. – Lévai G. – Kun É. – Sós D. – Glodán Gy. – Szabó M.: Investigation of the near-surface composition of industrial samples by mass spectrometry 33

Applicability and data evaluation method of Secondary Neutral Mass Spectrometry method was extended to the investigation of industrial samples with high surface roughness. We report about the depth profile analysis of coloured surface layers of hot dip galvanized steel sheets, silver layers produced by the galvanizing technique on the surface of copper plates and printed circuit board samples plated by the electroless nickel immersion gold (ENIG) technology. Beside of the high surface roughness of the samples (~100 µm) it was possible to determine the depth distribution of the concentration of the element with a few nanometer resolution. The determined near-surface distribution of elements provided fundamental information related to the characteristics of the samples, manufacturing technology and for the identification of hidden defects.

Szirmai G. – Tóth J. – Török T.: An XPS study of surface chemical composition of AlMg alloy after all the coating steps of the process of electroless Ni-P plating 37

A new surface pre-treatment procedure has been developed in one of our laboratories for electroless nickel (EN) plating, which appears to be an effective and environmentally benign treatment for the following deposition of a sound and high quality surface nickel coating with good adhesion.

For that purpose, the aluminium substrate was immersed in a mildly acidic solution (lactic acid) of sodium hypophosphite in order to modify the passive surface and make it suitable for the reductive chemical precipitation of the nickel-phosphorus nuclei from the electroless nickel plating bath. During this novel pre-treatment technique, the surface adsorption of the hypophosphite anions play an important role therefore several advanced surface testing and analytical techniques (Scanning Electron Microscopy-SEM, Transmission Electron Microscopy-TEM, Energy Dispersive X-ray Spectrometry-EDX, X-ray Photoelectron Spectroscopy-XPS) were applied in order to monitor and characterize the surface reactions and adsorption phenomena taking place during the pretreatment. The Al excited XPS (studying P 2p, O 1s, C 1s, Al 2p, Ni 2p photoelectron lines) proved to be one of the most powerful technique in the identification of the chemical species formed and present on the surfaces examined in this study.

Lassú G. – Svéda M. – Török T.: An analysis of enamel-steel adherence and transient layer in the function of firing time 41

The techniques which are used to characterize the enamel-steel interface are traditionally SEM and TEM and some kind of coupled XRF (X-Ray Fluorescence) elemental analysis microprobe methods. The preparation of the samples is difficult, and the nature of this analytical methods excludes the light elements. That is the reason why we use the GD-OES technique in our recent work to unlock these limitations. Our purposes with these research efforts are to analyze the behavior of the light elements, and to evaluate their effects in the bonding reactions. Adherence / microstructure / qualitative elemental depth profile results are presented in parallel to interpret them as the function of the variable firing time. The aim is to understand better the processes which take place. With this article we continue our new enamel-steel interface studies, and expand it by using another available analytical technique.

Kulcsár T. – Kékesi T.: Experimental monitoring and evaluation of the electrode processes in tin electrorefining ... 47

Relatively large amounts of tin dross, a basically oxidic waste material of high metal concentration, are generated during the lead-free soldering process, applied in the modern electronic industry. Electrorefining in dilute HCl media has proved suitable for the extraction of pure tin from the anodes cast after melting the collected dross, however disturbances arising during the course of electrolysis, like the loss of current, instability of the solution and the disordered cathodic deposition can be avoided after understanding the electrode processes. Therefore, a new measuring system has been developed, which can monitor the

mass changes of the anode or cathode with high precision without interrupting the process. Beside the in situ mass measurements, the potential and the current were also recorded and the solution composition was monitored by periodical sampling and classical or instrumental analysis. The results have shown that the increasing anode potential at anodic current densities higher than 1000 A/m² may cause increasing Sn(IV) concentrations, leading to unfavorable chemical reactions. A few percent alloying in the anode had virtually no influence on the processes. However, the tin concentration of the solution strongly influenced the cathodic processes. The disturbing effect of hydrogen evolved at the cathode was also pointed out. The purity of the produced tin was over 99.99%.

Tóth G. B. – Uchikoshi, M. – Kékesi T.: Potentiodynamic analysis of polarization properties influencing cathodic deposition in tin-chloride – HCl solutions ... 52

Electrorefining in HCl media is a promising way to process the lead-free soldering waste material arising from the electronic industry. However, the structure of the cathodic deposit implies difficulties in continuous operation. Results of potentiodynamic studies carried out by the chronopotentiometric technique have pointed out the kinetic behavior of the tin cathode in the solutions of various Sn and HCl concentrations under stationary conditions or various rates of stirring. The obtained polarization curves show the most important characteristics of electrode processes, which are correlated with the morphologic properties of cathodic deposition. The significance of the tin concentration and agitation of the electrolyte solution has been pointed out by the results.

Harangi Z. – Kékesi T.: Conversion of tin dioxide drosses obtained from soldering scrap by carbothermic reduction and alkaline fusion 57

Melting the soldering scrap originating from the electronic industry is used for casting the metal content into anodes. However it also produces an oxide dross, composed mainly of SnO₂, which is resistant to the most commonly used lixivants. Therefore, it should be converted for hydrometallurgical treatment. The most suitable approaches seem carbothermic reduction and alkaline fusion. The experiments have been carried out in the 200 °C wide temperature ranges above 800 and 700 °C, respectively. The structure and composition of the products were examined. The reduced material was leached with boiling 6M HCl, and the fused material was leached with 40 °C distilled water. Under the optimized conditions, approximately 90% conversion rates were achieved by both methods. Thus, the waste material skimmed from the surface of the metal melt can be brought into solution and finally utilized at the electrolytic tin extraction.

FORR-ÁSZ- „Környezetbiztonságos forraszanyagok anyagtudományi alapon történő fejlesztése primer és másodnyersanyagokból a járműipar számára”

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