Programme & The Book of Abstracts

Twenty-first Annual Conference

YUCOMAT 2019

&

Eleventh World Round Table Conference on Sintering – Science of Sintering & Its Future: Fifty Years Later

WRTCS 2019

Herceg Novi, Montenegro September 2 - 6, 2019

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TABLE OF CONTENTS

WELCOME SPEECH BY THE PRESIDENT OF IISS AND MRS-SERBIA		i
2019 MRS-SERBIA AWARD FOR A LASTING AND OUTSTANDING CONTRIBUTION TO MATERIALS SCIENCE AND ENGINEERING		iii
GENERAL INFORMATION		iv
CONFERENCE PROGRAMME		ix-xlviii
ORAL PRESENTATIONS:		
Opening Ceremony	(MRS-Serbia 2019 Award)	1
YUCOMAT Plenary Session I	(Y.PL.S.I.1.-5.)	2
WRTCS Plenary Session I	(W.PL.S.I.1.-6.)	7
YUCOMAT Plenary Session II	(Y.PL.S.II.1.-7.)	12
YUCOMAT Plenary Session III	(Y.PL.S.III.1.-3.)	20
WRTCS Plenary Session II	(W.PL.S.II.1.-3.)	22
YUCOMAT Plenary Session IV	(Y.PL.S.IV.1.-7.)	26
WRTCS Oral Session I	(W.O.S.I.1.-8.)	32
WRTCS/YUCOMAT Oral Session	(W.Y.O.S.1.-8.)	39
YUCOMAT Oral Session II	(Y.O.S.II.1.-13.)	47
YUCOMAT Oral Session III	(Y.O.S.III.1.-12.)	59
YUCOMAT Oral Session IV	(Y.O.S.IV.1.-9.)	70
YUCOMAT Oral Session V	(Y.O.S.V.1.-10.)	79
POSTER PRESENTATIONS:		
Session I (Symposium A and B1)	(P.S.A.1.-15.)	89
	(P.S.B.1.-8.)	104
Session II (Symposium B2 and C1)	(P.S.B.9.-18.)	112
	(P.S.C.1.-14.)	122
Session III (Symposiums C2, D, E and F)	(P.S.C.15.-18.)	136
	(P.S.D.1.-5.)	140
	(P.S.E.1.-8.)	145
	(P.S.F.1.-7.)	153

AUTHORS INDEX 158

ACKNOWLEDGEMENTS 172

W.Y.O.S.3.

Sintering process optimization for Cu-Al_2O_3 powders synthesized by novel method

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This paper presents sintered materials for use as contacts produced via novel synthesis method of starting powders by combination of explored conventional routes of thermochemical synthesis and mechanical alloying.
Starting raw materials for powder synthesis by thermochemical route were soluble salts, nitrates of copper and aluminum of p.a. quality, dissolved in distilled water (50wt.% solution) in suitable ratio for final powder to contain 50wt.% of Al_2O_3 in structure. Nitrate solution was spray dried and subjected to heat treatment (900 ºC/1h). Obtained oxides were reduced in hydrogen atmosphere (flow rate 20L/h at 350 °C for 1h) in order to obtain composite of Cu-Al_2O_3. Produced powders were used for mechanical alloying of atomized copper (5h, 300 min-1). Final amount of alumina Al_2O_3 in composite powder were 1, 1.5 and 2 wt.%. After mechanical alloying obtained powders were compacted by a uniaxial pressing (8×32×3mm, 500 kN). Sintering of samples was performed in hydrogen atmosphere in isothermal conditions at five different temperatures in the range from 725-925 °C for 15 to 120 min.
Results of characterization show, that increase of Al_2O_3 content has more noticeable effect on the electrical conductivity and hardness than sintering temperature and time. With increase of Al_2O_3 from 1 to 1.5 wt.% there is a slight decrease in both investigated properties, while with increase up to 2 wt.% Al_2O_3 significant decrease in electrical conductivity and hardness of sintered samples is observed.
According to achieved results optimum sintering parameters for composite materials produced by novel synthesis method based on copper with dispersed 1% Al_2O_3 are 875 ºC/60 min.
Based on the achieved results, this method provides production of contact materials with good combination of electrical and mechanical properties, but with estimated lower production costs.

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