Twelfth Young Researchers' Conference
Materials Science and Engineering

December 11-13, 2013, Belgrade, Serbia
Serbian Academy of Sciences and Arts, Knez Mihailova 36

Program and the Book of Abstracts

Materials Research Society of Serbia
Institute of Technical Sciences of SASA

December 2013, Belgrade, Serbia

Book title:
Twelfth Young Researchers' Conference - Materials Science and Engineering:
Program and the Book of Abstracts

Publisher:
Institute of Technical Sciences of SASA
Knez Mihailova 35/IV, 11000 Belgrade, Serbia
Tel: +381-11-2636994, fax: 2185263
http://www.itn.sanu.ac.rs

Editor:
Dr. Smilja Marković

Technical Editor:
Aleksandra Stojičić

Printer:
Gama digital centar
Autoput No. 6, 11070 Belgrade, Serbia
Tel: +381-11-6306992, 6306962
http://www.gdc.rs

Edition:
130 copies

Acknowledgement
The editor and the publisher of the Book of abstracts are grateful to the Ministry of Education, Sciences and Technological Development of the Republic of Serbia for its financial support of this book and The Twelfth Young Researchers' Conference - Materials Sciences and Engineering held in Belgrade, Serbia.

CIP - Каталогизација у публикацији
Народна библиотека Србије, Београд

66.017/.018(048)(0.034.2)

YOUNG Researchers Conference Materials Sciences and Engineering (12 ; 2013 ; Beograd)
Program ; #and the #Book of Abstracts / Twelfth Young Researchers' Conference Materials Sciences and Engineering December 11-13, 2013, Belgrade, Serbia ; [organized by] Materials Research Society of Serbia [and] Institute of Technical Sciences of SASA; [editor Smilja Marković]. - Belgrade : Institute of Technical Sciences of SASA, 2013 (Beograd : Gama digital centar). - XVI, 56 str. ; 30 cm

Tiraž 130. - Registar.

ISBN 978-86-80321-28-8
1. Materials Research Society of Serbia (Beograd)
a) Наука о материјалима - Апстракти b) Технички материјали - Апстракти
COBISS.SR-ID 203232780

X/3

Structural, morphological and electrical properties of sintered Fe_2O_3/TiO_2 nanopowder mixtures

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Starting nanopowders of TiO_2 (anatase 99.7%) and α-Fe_2O_3 (hematite) were mixed in the weight ratio 60:40 and 40:60. Green samples were sintered in the temperature range 750-1250^oC in air. Structural, morphological and electrical studies were carried out using XRD, SEM and EDS analysis and Hall measurements with the aim of analyzing the influence of the starting nanopowder structure on the resulting sample composition, density, grain size and electrical resistivity. Compared to pure anatase samples, the presence of hematite lowered the temperature of completion of the anatase to rutile phase transformation to 850^oC. Formation of pseudobrookite was also noted at this temperature. Further increase in the sintering temperature lead to increase in sample density and grain size and decrease in the electric resistivity, Hall coefficient and mobility.

X/4

Comparation of mechanical behaviour of SiC sintered specimen to analysis of surface defects

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This research examined SiC sintered specimens with high hardness and strength. This material is used to protect of projectile impact for military purposes. The testing procedure consists of structure examination obtained using XRD analysis, surface examination by SEM analysis and optical microscopy, examination of mechanical properties and density determination. Analysis confirmed surface irregularities characterized using image analysis. The sample is subjected to bending. Finite element modeling was used to simulate the behavior of sample subjected to bending in presence of critical damage on surface. It is confirmed that there is correlation between the largest irregularities determined on surface and measured strength of sample. Simulations show the significance of damage size. The size of damage on surface is considered to be the critical parameter for quality determination.