

Lecture Notes in Mechanical Engineering

Volodymyr Tonkonogyi ·

Vitalii Ivanov · Justyna Trojanowska ·

Gennadii Oborskyi · Milan Edl ·

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Predrag Dasic *Editors*

Advanced Manufacturing Processes

Selected Papers from the Grabchenko's
International Conference on Advanced
Manufacturing Processes
(InterPartner-2019),
September 10–13, 2019,
Odessa, Ukraine

 Springer

Lecture Notes in Mechanical Engineering

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Preface

This volume of Lecture Notes in Mechanical Engineering contains selected papers presented at the Grabchenko's International Conference on Advanced Manufacturing Processes (InterPartner-2019), held in Odessa, Ukraine, on September 10–13, 2019. The conference was organized by the Odessa National Polytechnic University, National Technical University “Kharkiv Polytechnic Institute,” Sumy State University, and International Association for Technological Development and Innovations.

InterPartner-2019 focuses on promoting research and developmental activities, intensification of scientific information interchange between researchers, developers, and engineers. The book was organized in three parts, according to the main conference topics: (1) Manufacturing Engineering, (2) Materials Engineering, and (3) Mechanical Engineering.

InterPartner-2019 received 101 contributions from 13 countries around the world. After a thorough peer-review process, the program committee accepted 63 papers, written by authors from 11 countries. Thank you very much to the authors for their contribution. These papers are published in the present book, achieving an acceptance rate of about 62%.

We would like to take this opportunity to thank members of the program committee and invited external reviewers for their efforts and expertise in contribution to reviewing, without which it would be impossible to maintain the high standards of peer-reviewed papers.

Thank you very much to keynote speakers: Ivan Kuric (Slovak Republic), Slawomir Luscinski (Poland), Milan Edl (Czech Republic), Athanasios Mamalis (Greece), Predrag Dasic (Serbia), and Vadym Stupnytsky (Ukraine) for sharing their knowledge and experience.

We appreciate the partnership with Springer, StrikePlagiarism, and EasyChair for their support during the preparation of InterPartner-2019.

Thank you very much to InterPartner Team. Their involvement and hard work were crucial to the success of the conference.

InterPartner's motto is "Science unites people together".

September 2019

Volodymyr Tonkonogyi

Vitalii Ivanov

Justyna Trojanowska

Gennadii Oborskyi

Milan Edl

Ivan Kuric

Ivan Pavlenko

Predrag Dasic

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Manufacturing Engineering

Experimental Study of the Process of Borazon Grinding of Thermal Barrier Coating of ZrO

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Abstract. When grinding thermo-barrier sprayed coatings, there is always a potential danger of damage due to cutting forces. It is also necessary to take into account grinding contact temperatures, the thermal field of which can cause large residual stresses, cracks and peeling of the sprayed layer from the base metal. The studies of this work are aimed at establishing the values of these factors depending on the cutting conditions and grain size of the borazon wheel. Experimental studies have shown that the values of the component of the cutting force P_y , depending on the processing conditions, can reach values of the order of 30N. The values of the cutting force component P_z , depending on the processing modes, can reach values of 15 - 17N. Cutting forces do not cause temporary stresses that could lead to cracks in the deposited ZrO₂ layer. Contact temperatures when grinding the sprayed ZrO₂ layer can reach values of the order of 700 to 900 °C. The heat field during the passage through the thickness of the sprayed layer weakens sharply and at a depth of 2 mm from the surface (thickness of the deposited thermal barrier layer) reaches values close to room temperature, which eliminates the exfoliation of the thermal barrier layer during grinding. The residual stresses arising under the action of contact temperatures on the surface reach significant values of the order of 800 to 900 MPa, however these values are less than the thermal barrier layer strength and do not lead to cracks, naturally within the limits of the processing modes under study. Throughout the thickness of the thermal barrier layer, the residual stresses decrease and at the interface of the “sprayed layer - metal” reach values of the order of 10–15 MPa, which does not cause peeling of the sprayed layer. The amount of surface roughness when grinding a thermal barrier coating with borazon wheel LO 125/100 C10 100% LO 160/125 C10 100%, LO 250/160 C10 100%, then take Nz12, Nz16, Nz25, is within Rz 1.5 – 2.5 μm.

Keywords: Contact Grinding Temperatures, Cutting Forces, Residual Stresses, Roughness, Circle Wear.

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