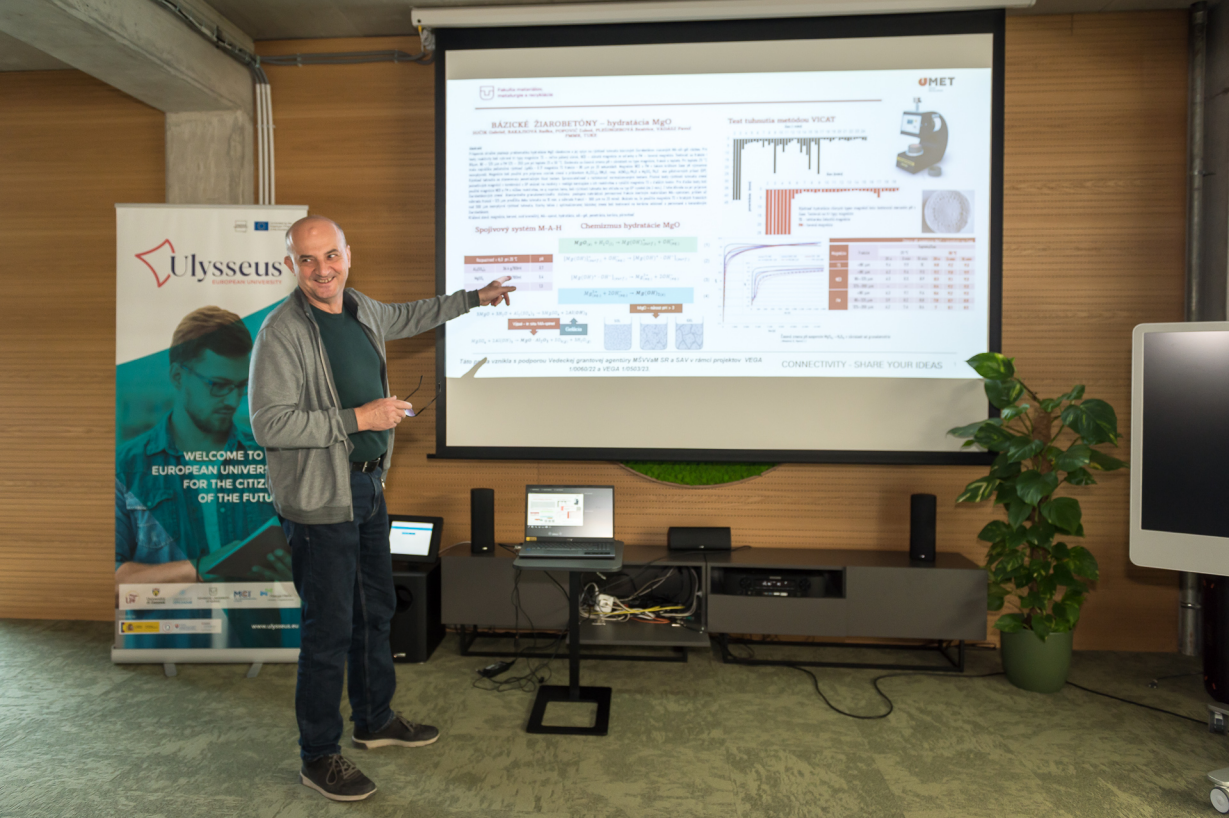
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BÁZICKÉ ŽIAROBETÓNY – hydratácia MgO
Spojivový systém M-A-H
Chemizmus hydratácie MgO
Test tuhnutia metódou VICAT
Táto práca vznikla s podporou Vedeckej grantovej agentúry MŠVVaM SR a SAV v rámci projektov VEGA 1/0063/22 a VEGA 1/0563/23.
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TECHNICKÁ UNIVERZITA V KOŠICIACH
Fakulta materiálov, metalurgie a recyklácie
Termodynamické simulácie procesov rafinácie ocele v priebehu plynulého odlievania ocele so zameraním sa na rafinačné reakcie medzi oceľou a troskou
Špecifikácia systému chemických reakcií na rozhraní oceľ – troska v medzipanve
Sledovanie stability jednotlivých typov vtrúsenín – oxidov, nitridov a
Simulácia mechanizmus vzniku a segregácie vtrúsenín v priebehu solidifikácie ocele.
Simulácia metalurgickej čistoty ocele v kontrolovaným obsahom a zložením oxidických a sulfidických vtrúsenín v priebehu plynulého odlievania ocele.
Acknowledgment: This research was supported by the Slovak Research and Development Agency under project number APVV-21-0396 for their financial support of this research work
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Flow pattern of liquid steel in a 4-stream ladle using a "Spheric K4" turbulence inhibitor
Used turbulence inhibitor
Reference configuration in the 4-strand tundish
Tested configuration in the 4-strand tundish
Conclusions:
Acknowledgment:
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TECHNICKÁ UNIVERZITA V KOŠICIACH
Fakulta materiálov, metalurgie a recyklácie
The Future of Steel: Carbon Border Adjustment Mechanisms and Its Impact by 2034
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Analytical modelling of nitrogen content prediction in pig iron and molten steel during steelmaking process
Ing. Jaroslav Demeter, PhD.
Funded by the EU NextGenerationEU though the Recovery and Resilience plan for Slovakia under the project No. 09103-03-V04-00047
PROJECT OBJECTIVES
This project aims to predict nitrogen content in molten metal at various steelmaking stages (pig iron, BOF/EAF crude steel, and secondary steelmaking). To achieve this, we will analyze real operational data, preprocess, synchronize, and process data. Statistical procedures will be used to develop predictive models, which will be tested and compared using machine learning techniques. The accuracy of these models will be quantified and compared to actual measurements. Additionally, analytical modeling techniques will be used to understand the relationship between factors like chemical composition, temperature, and nitrogen content. The effectiveness of the methodology will be assessed by comparing predicted and actual nitrogen values, using statistical indicators like MAE, MPE, and MAPE. The goal is to achieve high prediction accuracy within a 5-10 ppm range.
RELEVANCE, QUALITY AND NOVELTY
The current methods for predicting nitrogen content in molten metal are insufficient and rely heavily on empirical experience and traditional procedures. This often leads to suboptimal quality, especially when input materials or production processes change.
Nitrogen content is currently determined through laboratory analysis, which is time consuming and only performed for high quality steel grades. This delayed information hinders timely decision making and can lead to increased nitrogen levels, negatively impacting steel properties. This project aims to address these issues by developing predictive models for nitrogen content in molten pig iron and steel. By analyzing real-time data and employing advanced statistical and analytical techniques, the models will enable accurate and timely predictions. This will significantly improve production efficiency, reduce costs, and enhance the quality of the final product. Furthermore, by aligning with the European Research Area's focus on scientific advancement and collaboration, this project contributes to the overall goal of fostering innovation and competitiveness within the steelmaking industry.
IMPACT
Predictive models are valuable tools for optimizing steelmaking processes. This project aims to develop and apply an analytical model to predict nitrogen content in molten pig iron and metal. While ambitious, the project's goals are achievable within the given timeframe.
PROJECT PLAN:
The overall structure of the submitted project plan is scheduled for 24 months. Implementation starting on 1.9.2024 and ending on 31.8.2026. Time frame for the implementation of given work packages are listed in Gantt diagram below.
For more information about this project and actual state of the solution, please log on to site:
www.nitrogen-prediction.eu
Funded by the European Union
NextGenerationEU
RECOVERY AND RESILIENCE PLAN
GOVERNMENT OFFICE OF THE SLOVAK REPUBLIC
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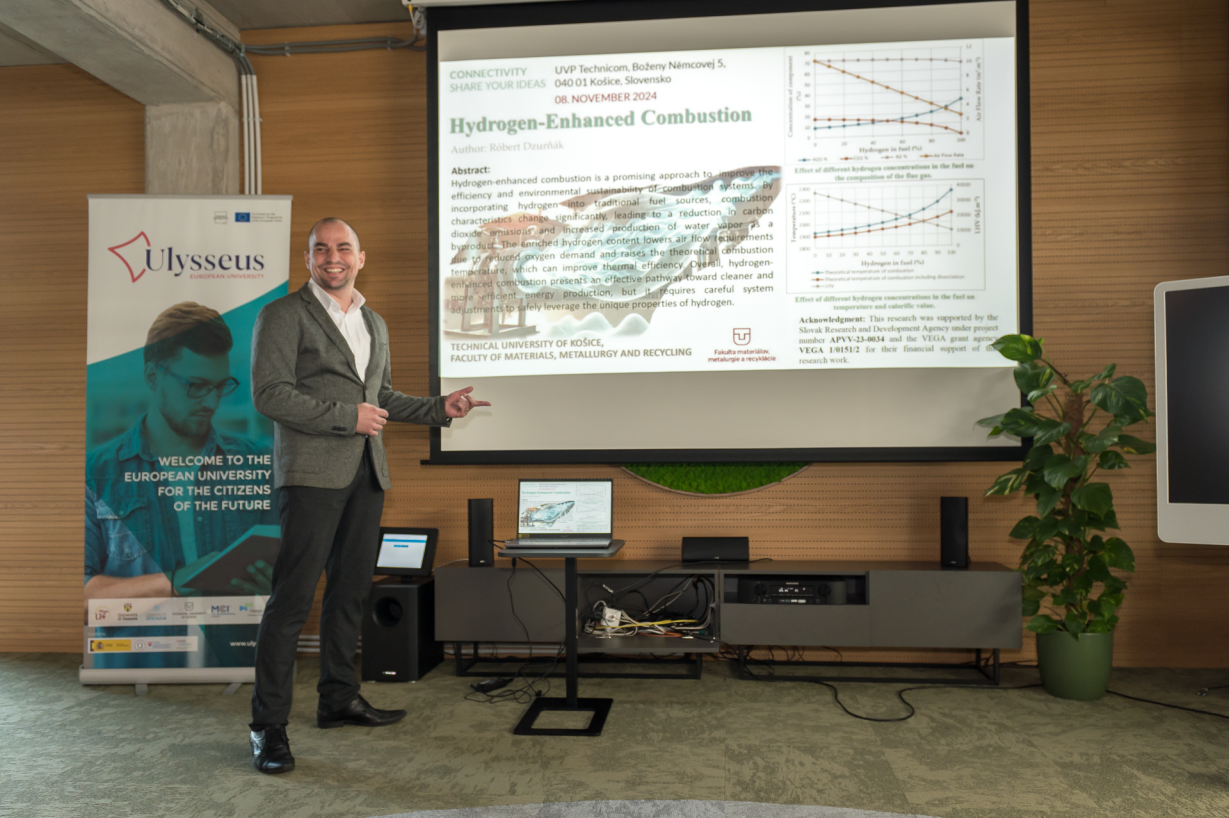
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040 01 Košice, Slovensko
08. NOVEMBER 2024
Hydrogen-Enhanced Combustion
Author: Róbert Dzurňák
Abstract:
Hydrogen-enhanced combustion is a promising approach to improve the efficiency and environmental sustainability of combustion systems. By incorporating hydrogen into traditional fuel sources, combustion characteristics change significantly, leading to a reduction in carbon dioxide emissions and increased production of water vapor as a byproduct. The enriched hydrogen content lowers air flow requirements due to reduced oxygen demand and raises the theoretical combustion temperature, which can improve thermal efficiency. Overall, hydrogen-enhanced combustion presents an effective pathway toward cleaner and more efficient energy production, but it requires careful system adjustments to safely leverage the unique properties of hydrogen.
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FACULTY OF MATERIALS, METALLURGY AND RECYCLING
Fakulta materiálov, metalurgie a recyklácie
Hydrogen in fuel [%]
Air Flow Rate [m³/h]
Effect of different hydrogen concentrations in the fuel on the composition of the flue gas.
Hydrogen in fuel [%]
Theoretical temperature of combustion
Theoretical temperature of combustion including dissociation
LHV
Effect of different hydrogen concentrations in the fuel on temperature and calorific value.
Acknowledgment: This research was supported by the Slovak Research and Development Agency under project number APVV-23-0034 and the VEGA grant agency VEGA 1/0151/2 for their financial support of the research work.
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Faculty of Materials, Metallurgy and Recycling
Laboratórium testovania redukovateľnosti materiálov
Ing. Zuzana Milkovičová, PhD.
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zariadenie RF-33/TV/RDI
normovaná skúška ISO 4695:2007
Stanovenie redukovateľnosti indexom redukovateľnosti
normovaná skúška ISO 7215:2007
Stanovenie relatívnej redukovateľnosti
normovaná skúška ISO 4696-1:2007
Stanovenie ukazovateľov rozpadavosti pri nízkoteplotnej redukcii statickými metódami (redukcia pomocou CO, CO2, H2 a N2)
zariadenie LAC – odporová pec s retortou
nenormované skúšky na univerzálnom pecnom zariadení, na ktorom je možné testovať rôzne druhy materiálov, event.s prispôsobovať podmienky testovania (rôzne redukčné atmosféry, teplotné podmienky, reakčné časy)
Acknowledgments: This work was supported by Slovak Research and Development Agency (APVV), Slovak Republic, No. APVV-21-0142
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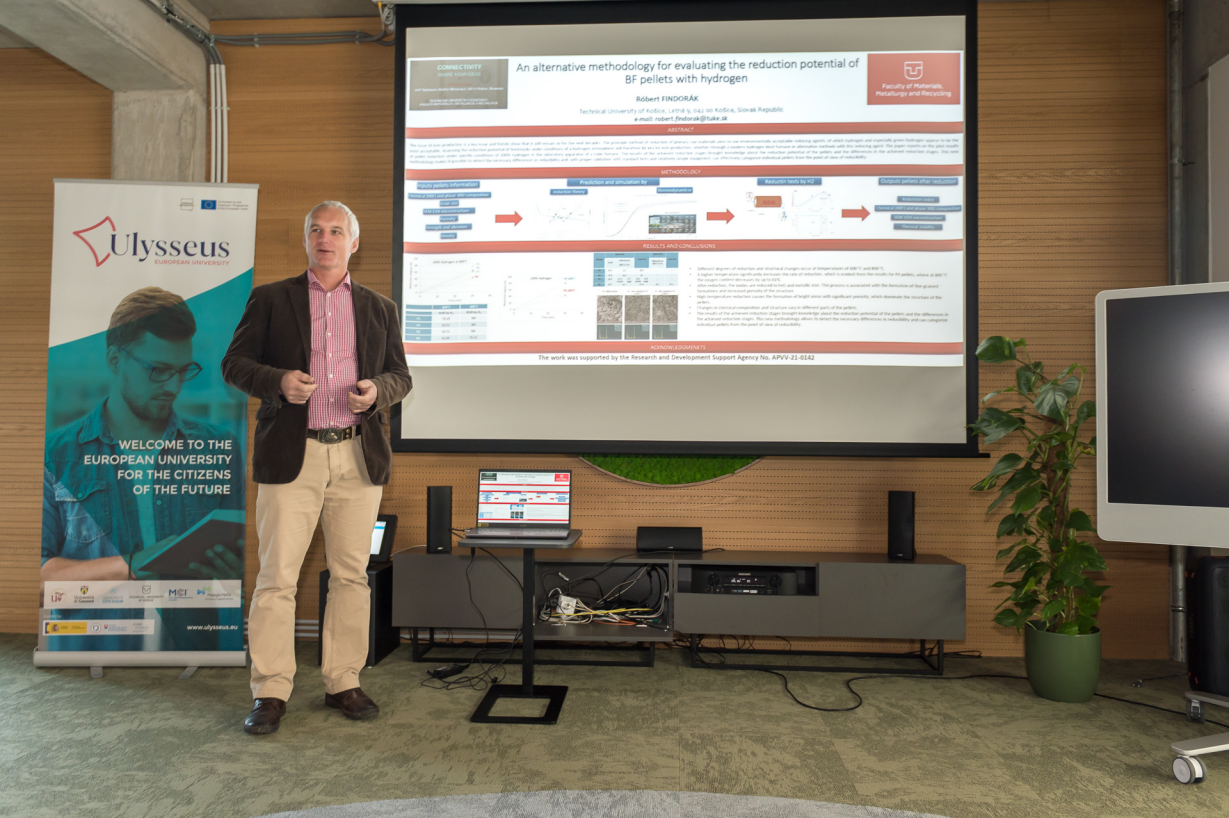
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An alternative methodology for evaluating the reduction potential of BF pellets with hydrogen
Róbert FINDORÁK
Technical University of Košice, Letná 9, 042 00 Košice, Slovak Republic
e-mail: robert.findorak@tuke.sk
Faculty of Materials, Metallurgy and Recycling
ABSTRACT
METHODOLOGY
RESULTS AND CONCLUSIONS
ACKNOWLEDGMENTS
The work was supported by the Research and Development Support Agency No. APVV-21-0142