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Utilisation of Blast Furnace and Bof Slag

BRONSON RYKER

The Utilization of Slag in Civil Infrastructure Construction University-Press.org
Please note that the content of this book primarily consists of articles available from Wikipedia or other free sources online. Pages: 67. Chapters: Bessemer process, Damascus steel, Pig iron, Pattern welding, Smelting, Blast furnace, History of ferrous metallurgy, List of preserved historic blast furnaces, Electric arc furnace, Crucible steel, Tinning, Puddling, Pakistan Steel Mills, Basic oxygen steelmaking, Bloomery, Blowing engine, Carburizing, Hlsarna steelmaking process, Slag, Ladle, Non-metallic inclusions,

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Steelmaking Woodhead Publishing

Slag corrosion and erosion has been a major wear factor for refractories wear in contact with molten iron and steel. In blast furnace ironmaking, the slag/iron interface plays a more important role than does the slag/refractory interface. On the other hand in steelmaking, the slag in the ladles and tundish predominantly affect refractory wear. This paper presents the results of a detailed microstructural evaluation of (a) slag and slag/iron interactions with A12O3-SiC-C refractories for ironmaking in blast furnaces, (b) basic oxygen furnace and ladle slag interactions with alumina spinel refractories for steelmaking, and (c) slag interactions with working refractory lining for continuous casting tundishes. Results will also be presented on refractory wear/failure due to simultaneous corrosion and penetration by the slag.

The High Performance

Industrial Aggregate
Springer Nature
This book focuses on an important technology for mineralizing and utilizing CO2 instead of releasing it into the atmosphere. CO2 mineralization and utilization demonstrated in the waste-to-resource supply chain can “reduce carbon dependency, promote resource and energy efficiency, and lessen environmental quality degradation,” thereby reducing environmental risks and increasing economic benefits towards Sustainable Development Goals (SDG). In this book, comprehensive information on CO2 mineralization and utilization via accelerated carbonation technology from theoretical and practical considerations was presented in 20 Chapters. It first introduces the concept of the carbon cycle from the thermodynamic point of view and then discusses principles and applications regarding environmental impact assessment of carbon capture, storage and utilization technologies. After that, it describes the theoretical and practical considerations for “Accelerated Carbonation (Mineralization)” including analytical methods, and systematically presents the carbonation mechanism and modeling (process chemistry, reaction kinetics and mass transfer) and system analysis (design and analysis of experiments, life cycle assessment and cost benefit analysis). It then provides physico-chemical properties of different

types of feedstock for CO2 mineralization and then explores the valorization of carbonated products as green materials. Lastly, an integral approach for waste treatment and resource recovery is introduced, and the carbonation system is critically assessed and optimized based on engineering, environmental, and economic (3E) analysis. The book is a valuable resource for readers who take scientific and practical interests in the current and future Accelerated Carbonation Technology for CO2 Mineralization and Utilization.

Sustainable agriculture using blast furnace and steel slags as liming agents : contract no. 7210-PR/267, 1 July 2001 to 30 June 2004 ; final report Woodhead Publishing

Blast Furnace Ironmaking: Analysis, Control, and Optimization uses a fundamental first principles approach to prepare a blast furnace mass and energy balance in ExcelTM. Robust descriptions of the main equipment and systems, process technologies, and best practices used in a modern blast furnace plant are detailed. Optimization tools are provided to help the reader find the best blast furnace fuel mix and related costs, maximize output, or evaluate other operational strategies using the ExcelTM model that the reader will develop. The first principles blast furnace ExcelTM model allows for more comprehensive process assessments than

the 'rules of thumb' currently used by the industry. This book is suitable for undergraduate and postgraduate science and engineering students in the fields of chemical, mechanical, metallurgical and materials engineering. Additionally, steel company engineers, process technologists, and management will find this book useful with its fundamental approach, best practices description, and perspective on the future. Provides sample problems, answers and assignments for each chapter Explores how to optimize the blast furnace operation while maintaining required temperatures and gas flowrates Describes all major blast furnace equipment and best practices Features blast furnace operating data from five continents **Iron Blast-furnace Slag Production, Processing, Properties, and Uses** Springer Topics covered in this collection include the following: •Enabling & Understanding Sustainability - Ferrous & Non-ferrous Metals Processing •Understanding & Enabling Sustainability - (Rechargeable) Batteries •Enabling & Understanding Sustainability - Rare Earth Element Applications •Enabling & Understanding Sustainability - Building Materials & Slag Valorisation •Designing Materials and Systems for Sustainability •Understanding & Enabling Sustainability - Light Metals Recycling &

Waste Valorisation •Understanding & Enabling Sustainability - Education Research Innovation I •Understanding & Enabling Sustainability - Education Research Innovation II + Electronic Equipment

Final Report to the American Iron and Steel Institute Springer

The Utilization of Slag in Civil Infrastructure Construction strives to integrate the theory, research, and practice of slag utilization, including the production and processing of slags. The topics covered include: production and smelting processes for metals; chemical and physical properties of slags; pretreatment and post-treatment technology to enhance slag properties; potential environmental impact; mechanisms of potential expansion; special testing methods and characteristics; slag processing for aggregate and cementitious applications; suitability of slags for use in specific applications; overall properties of materials containing slags; and commercialization and economics. The focus of the book is on slag utilization technology, with a review of the basic properties and an exploration of how its use in the end product will be technically sound, environment-friendly, and economic. Covers the production, processing, and utilization of a broad range of ferrous, non-ferrous, and non-metallurgical slags Provides information on applicable methods for a particular slag and its

utilization to reduce potential environmental impacts and promote natural resource sustainability Presents the overall technology of transferring a slag from the waste stream into a useful materials resource Provides a detailed review of the appropriate utilization of each slag from processing right through to aggregate and cementitious use requirements

Evaluation of Blast Furnace Slag from Algoma Steel Corporation's No. 7 Blast Furnace for Possible Use as an Additive to Concrete Springer Science & Business Media

This book presents selected articles from the 5th International Conference on Geotechnics, Civil Engineering Works and Structures, held in Ha Noi, focusing on the theme “Innovation for Sustainable Infrastructure”, aiming to not only raise awareness of the vital importance of sustainability in infrastructure development but to also highlight the essential roles of innovation and technology in planning and building sustainable infrastructure. It provides an international platform for researchers, practitioners, policymakers and entrepreneurs to present their recent advances and to exchange knowledge and experience on various topics related to the theme of “Innovation for Sustainable Infrastructure”.

Fuels Springer

At present, a lot of metallurgical solid wastes have not been timely and

effectively recycled, resulting in serious problems of environmental pollution and waste of resources. As a result, large-scale comprehensive utilization technologies have been initiated, including slag dry granulation technology, steel slag cement technology, slag wool technology, slag waste heat recovery technology, etc. The comprehensive utilization of metallurgical solid waste has attracted worldwide attention. It is an effective way to improve the utilization efficiency of resources and the added value of products by using scientific metallurgical solid waste recycling methods. This book intends to provide the reader with a comprehensive overview of metallurgical solid wastes comprehensive utilization technology. The comprehensive utilization methods of four representative metallurgical solid wastes are emphatically described, such as blast furnace slag, steel slag, tailings and metallurgical dust.

CIGOS 2019, Innovation for Sustainable Infrastructure Royal Society of Chemistry

As ironmakers are well aware, it was only a few decades ago that the blast furnace was viewed as a strange 'black box'. Recently, however, various in-furnace phenomena have become the subject of serious scientific study, largely as the result of the 'dissection' of dead furnaces, together with the development of

advanced monitoring and control techniques. In this way, a new frontier has been opened within the venerable domain of metallurgy. In the light of these new developments, the Committee on Reaction within Blast Furnaces was set up in March 1977 by the Joint Society ofIron and Steel Basic Research - a cooperative research organization of the Iron and Steel Institute of Japan (ISIJ), the Japan Institute of Metals (JIM) and the Japan Society for the Promotion of Science (JSPS). Consisting of twenty-six members and advisors drawn from the fields of academia and industry, this committee collected, discussed, and evaluated numerous papers during its five year commission. Particular attention was paid to the interpretation of findings drawn from the autopsy of dead furnaces, in the context of the live furnace state, and the correlation of data regarding cohesive zone configuration, level, and furnace performance. The results of this intense research activity are presented here in the hope that they will serve not only as a source of enrichment to the professional knowledge of researchers and operators, but also as textual material for graduate students in the field of metallurgy.

Separation Technologies for the Industries of the Future Springer

In Indiana, the steelmaking industries and power plants generate large quantities of steel slag, blast furnace

slag and fly ash every year. The excess of these underutilized industrial by-products are stockpiled and eventually landfilled at disposal sites. Use of steel slag, fly ash and blast furnace slag in road applications, such as in subgrade stabilization projects, can be a cost-effective alternative to lime stabilization in some cases. In addition, use of large quantities of these underutilized industrial by-products in these types of applications helps to reduce the need for new disposal sites and to conserve natural resources. The main objectives of this research were to evaluate the feasibility of using soil-steel slag-Class-C fly ash and soil-steel slag-blast furnace slag mixtures in subgrade applications and to implement the selected mixture as a subgrade material in a road construction project of INDOT. In order to achieve these goals, in situ clayey soils, collected from a prospective implementation site, were characterized through a series of laboratory tests which included specific gravity, grain size distribution, Atterberg limits, compaction and unconfined compressive strength. Two types of steel slag mixtures were evaluated for use in subgrade stabilization applications: i) steel slag-Class-C fly ash mixtures and ii) steel slag-blast furnace slag mixtures. The mechanical properties of soil-5% steel slag-5% Class-C fly ash, soil-7% steel slag-3% Class-C fly ash, soil-8% steel slag-2% Class-C fly ash, and soil-7% steel slag-3%

blast furnace slag mixtures were determined through compaction and unconfined compression tests. CBR swelling tests were also performed to assess the swelling potential of the mixtures. The optimum moisture content and maximum dry unit weight of the in situ clayey soil samples were 13% and 18.56 kN/m3 (118.2 pcf), respectively. Based on the results of the long-term CBR swelling tests, the maximum swelling strain of the compacted soil samples was approximately 0.41 %. The average unconfined compressive strength of the in situ soil samples was 282.9 kPa (41 psi). Unconfined compressive strength tests performed on various mixtures at different times indicated the occurrence of stronger cementitious reactions in the soil-steel slag-Class-C fly ash mixtures than in the soil-steel slag-blast furnace slag mixtures. The two-day and seven-day unconfined compressive strength of the compacted soil-7% steel slag-3% Class-C fly ash mixture were 820 kPa (119 psi) and 886 kPa (128 psi), respectively. The maximum 1-D swelling strain of the soil-7% steel slag-3% Class-C fly ash mixture was 0.13 %. The soil-7% steel slag-3% Class-C fly ash mixture was selected as the most suitable and cost-effective subgrade material for the implementation project. The implementation project for the soil-steel slag-Class-C fly ash mixture was located at the intersection of 109th

Avenue and I-65, near Crown Point, Indiana. The pre-mixed 7% steel slag-3% Class-C fly ash mixture was used to stabilize the in situ subgrade soils of some sections of the I-65 ramps located in the SW and NW quadrants of the intersection of 109th Avenue and I-65. Field compaction quality control was done by performing DCPTs and nuclear gauge tests. Cracks or signs of distress were not observed on the subgrade before base course and concrete placement. The soil-steel slag-Class-C fly ash stabilized subgrade performed satisfactorily.

Emerging Research and Opportunities Joint Transportation Research Program

New Trends in Eco-efficient and Recycled Concrete describes different recycled materials that have been used in eco-efficient concrete, reviewing previous publications to identify the most effective recycled materials to be applied in concrete manufacture. New trends on eco-efficient concrete are presented, filling a gap in the market. Sections cover various recycled materials applied in concrete production, present the latest on the lifecycle analysis of recycled aggregate concrete, detail new trends in recycled aggregate concrete research, and finally, present updates on upscaling the use of recycled aggregate concrete and structural reliability. Focuses on new trends in recycled aggregate concrete and

its applications (rather than the more subjective ‘sustainability’ aspects) Contains very important contributions from researchers in eco-efficient concrete, including Chi Sun Poon, Jorge de Brito, Valeria Corinaldesi, Francisco Agrela, etc. Presents a ‘one stop’ reference for a graduate course on sustainable construction

Blast Furnace Slag Phase Diagrams

Springer Science & Business Media

This book is a definitive reference on the environmental geochemistry and resource potential of metallurgical slags

A Report Springer Science & Business Media

Steel slag is a by-product of steelmaking and refining processes. In 2006, 10-15 million metric ton of steel slag was generated in the U.S. Out of the total steel slag produced in the U.S. every year, about 50-70% is used as aggregate for road and pavement construction and approximately 15-40% is stockpiled in steel plants and eventually landfilled at slag disposal sites. Since current levels of steel slag stockpiling and landfilling are not sustainable, alternative geotechnical engineering applications for steel slag are being explored to alleviate the slag disposal problem and to help save dwindling natural resources. The main objectives of this research were to determine the geotechnical engineering properties of two types of steel slag generated from different steelmaking operations and to assess

their potential use in subgrade stabilization and embankment construction. Samples of fresh and aged basic-oxygen-furnace (BOF) slag and of fresh electric-arc-furnace-ladle (EAF(L)) slag were characterized through a series of laboratory tests (specific gravity, grain-size analysis, X-ray diffraction, compaction, maximum and minimum density, large-scale direct shear, consolidated drained triaxial and swelling tests).

Recovery and Utilization of Metallurgical Solid Waste Springer Science & Business Media Characteristics and Uses of Steel Slag in Building Construction focuses predominantly on the utilization of ferrous slag (blast furnace and steel slag) in building construction. This extensive literature review discusses the worldwide utilization of ferrous slag and applications in all sectors of civil engineering, including structural engineering, road construction, and hydro-technical structures. It presents cutting-edge research on the characteristics and properties of ferrous slag, and its overall impact on the environment. Comprehensively reviews the literature on the use of blast furnace and steel slag in civil engineering Examines the environmental impact of slag production and its effect on human health Presents cutting-edge research from worldwide studies on the use of blast furnace and steel slag

Foamed Blast-Furnace Slag. By T. W. Parker, etc IGI Global
This state-of-the-art volume covers the latest and future trends in measuring, monitoring and modeling the properties of cement based materials. The book contains 94 papers and presents the latest research work of renowned experts. It acts as a survey of the most up-to-date research in the field.
Reaction of Iron and Steel Slags with Refractories
Characteristics and Uses of Steel Slag in Building Construction
Characteristics and Uses of Steel Slag in Building ConstructionWoodhead Publishing
Blast Furnace Slag Usage and Guidance for Indiana
Purdue University Press
Why is steel slag the proven industrial aggregate? There are two principal reasons. Firstly, there is a long success record in many countries, and secondly the material is environmentally friendly and will always be available wherever steel is made. It is only since the early 1900's that slag has been extensively re-cycled in a global sense. Some of slag's common uses today include concrete and asphalt aggregates, road sub-base, pipe bedding and railway ballast. The first documented use of blast furnace slag in asphalt was in England in 1903 by E. Purnell Hooley, the Nottingham County Surveyor. Today, almost all blast furnace slag in industrialised countries is used for aggregates and cement production. Steel slag, as distinct from blast

furnace slag, is generally considered unsuitable for use in concrete because it normally contains small quantities of expansive lime and Magnesite. However steel slag has been commercially used as a road aggregate for over 90 years, and as an asphalt aggregate since at least 1937. In other fully industrialised countries like USA, Canada, Australia, New Zealand, Singapore, Japan, Europe and in some South America countries, slags are no longer viewed as wastes, but as process co-products. All Ferrous slags contain varying amounts of valuable metal which can be recovered by a magnetic separation methods, and at the same time valuable construction aggregates are made by crushing and screening. Converting a disposal cost into a sale revenue offers considerable cost benefits to the steel-maker whilst giving engineers access to quality raw materials and at the same time reducing the consumption of mineral resources. This paper focuses on steel slag, its value as a cost-effective high performance construction material, and the potential benefits for steelmakers, slag processors, engineers and the community at large. For the covering abstract of this conference see IRRD number 872978. New Trends in Eco-efficient and Recycled Concrete Elsevier Separation processesâ€"or processes that use physical, chemical, or electrical forces to isolate or

concentrate selected constituents of a mixtureâ€"are essential to the chemical, petroleum refining, and materials processing industries. In this volume, an expert panel reviews the separation process needs of seven industries and identifies technologies that hold promise for meeting these needs, as well as key technologies that could enable separations. In addition, the book recommends criteria for the selection of separations research projects for the Department of Energy's Office of Industrial Technology.

Carbon Dioxide Mineralization and Utilization BoD – Books on Demand

This book is an attempt to consolidate the published research related to the use of Supplementary Cementing Materials in cement and concrete. It comprises of five chapters. Each chapter is devoted to a particular supplementing cementing material. It is based on the literature/research findings published in journals/conference proceeding, etc. Topics covered in the book are; coal fly ash, silica fume (SF), granulated blast furnace slag (GGBS), metakaolin (MK), and rice husk ash (RHA). Each chapter contains introduction, properties of the waste material/by-product, its potential usage, and its effect on the properties of fresh and hardened concrete and other cement based materials.

Blast Furnace Slag

Springer Nature

This book comprises

selected papers from the International Conference on Civil Engineering Trends and Challenges for Sustainability (CTCS) 2019. The book presents latest research in several areas of civil engineering such as construction and structural engineering, geotechnical engineering, environmental engineering and sustainability, and geographical information systems. With a special emphasis on sustainable development, the book covers case studies and addresses key challenges in sustainability. The scope of the contents makes the book useful for students, researchers, and professionals interested in sustainable practices in civil engineering.

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