

< Back to results | 1 of 2 | Next >

 Download  Print  Save to PDF  Add to List  Create bibliography

IIUM Engineering Journal • Volume 26, Issue 2, Pages 230 - 239 • 2025

Document type

Article

Source type

Journal

ISSN

1511788X

DOI

10.31436/iiumej.v26i2.3509

View more 

UTILIZATION OF MSW-DERIVED BIOCHAR FOR PRODUCTION OF IRON THROUGH SOLID-SOLID REACTION

Purwanto, Hadi^a; Rozhan, Alya Naili^b ; Zulaini, Danial Faiz^b; Ani, Mohd Hanafi^b

 Save all to author list

^a Department of Engineering Management, University of International Semen Indonesia, West Java, Gresik, 61122, Indonesia

^b Department of Manufacturing and Materials Engineering, Kulliyyah of Engineering, International Islamic University Malaysia, Jalan Gombak, Kuala Lumpur, 53100, Malaysia

 View PDF  Full text options  Export 

Cited by 0 documents

Inform me when this document is cited in Scopus:

Set citation alert >

Related documents

Production of pig iron nugget from low-grade iron ore and pyrolyzed oil-palm-empty-fruit-bunch composites
Setiawan, A. , Suratha, R.P. , Harjanto, S.
(2019) *Iop Conference Series Materials Science and Engineering*

Utilization of Empty Fruit Bunch Derived Vapor for Carbon Deposition within Iron Ores
Hasan, M. , Alya Naili, R. , Hadi, P.
(2022) *Key Engineering Materials*

Production of metallic iron from electric arc furnace (EAF) slag using palm shells char/coke blends
Ismail, A.N. , Yunos, N.F.D.M. , Rajeswari, M.S.R.
(2021) *Aip Conference Proceedings*

View all related documents based on references

Find more related documents in Scopus based on:

Authors > Keywords >

Abstract

Author keywords
Sustainable Development Goals
SciVal Topics
Metrics

Abstract

Every year, the increasing human population has contributed to the abundance of Municipal Solid Waste (MSW) at designated landfills, especially in Malaysia. On the other hand, in the iron and steel industry, a high demand for steel production has caused an increase in CO₂ production, which would, unfortunately, contribute to global warming. Therefore, sustainable solutions are needed to avoid this environmental crisis from worsening. This study employed an effective approach, utilizing low-grade iron ore from Pahang to produce iron by using MSW-derived biochar as an alternative to coal as a reductant and energy source. This project aims to study the mechanism of the solid-solid reduction reaction of iron ore with carbon. MSW was collected and prepared before the slow pyrolysis to obtain the MSW-derived biochar. Iron ore was characterized by using X-Ray Fluorescence (XRF) for elemental composition determination and X-Ray Diffraction (XRD) to observe the presence of mineral phases. In this research, the solid-solid reaction was conducted for the reduction reaction at 900°C with residence times of 1 hour, 3 hours, and 5 hours. From the research that has been conducted, temperature and residence time were found to influence the elemental composition, reduction degree, and mineral phase transformation of iron. © (2025), (International Islamic University Malaysia-IIUM). All rights reserved.

References (10)

View in search results format >

☐ All

Export  Print  E-mail  Save to PDF Create bibliography

☐ 1

Ali, H.M., Tyagi, V.K., Kazmi, A.A., Ojha, C.S.P.

Biohythane production from organic fraction of municipal solid waste: Clean and green energy generation under circular economy framework

(2024) *International Journal of Hydrogen Energy*, 95, pp. 1080-1094. Cited 3 times.
<https://www.sciencedirect.com/science/journal/03603199>
doi: 10.1016/j.ijhydene.2024.11.251

[View at Publisher](#)

☐ 2

Yong, Z.J., Bashir, M.J.K., Ng, C.A., Sethupathi, S., Lim, J.W., Show, P.L.

Sustainable waste-to-energy development in Malaysia: Appraisal of environmental, financial, and public issues related with energy recovery from municipal solid waste

(2019) *Processes*, 7 (10), art. no. 676. Cited 105 times.
https://res.mdpi.com/d_attachment/processes/processes-07-00676/article_deploy/processes-07-00676-v3.pdf
doi: 10.3390/pr7100676

[View at Publisher](#)

☐ 3

Traven, L.

Sustainable energy generation from municipal solid waste: A brief overview of existing technologies (Open Access)

(2023) *Case Studies in Chemical and Environmental Engineering*, 8, art. no. 100491. Cited 21 times.
www.journals.elsevier.com/case-studies-in-chemical-and-environmental-engineering/
doi: 10.1016/j.cscee.2023.100491

[View at Publisher](#)

☐ 4

Khamis, S.S., Purwanto, H., Salleh, H.M., Rozhan, A.N., Rahman, M.A., Warimani, M., Alam, N.

Novel energy recovery from an integrated municipal solid waste and leachate treatment system (Open Access)

(2024) *Waste Disposal and Sustainable Energy*, 6 (1), pp. 53-61. Cited 3 times.
<https://www.springer.com/journal/42768>
doi: 10.1007/s42768-023-00177-9

[View at Publisher](#)

- 5 Rozhan, A.N., Ani, M.H., Salleh, H.M., Akiyama, T., Purwanto, H.
Development of carbon-infiltrated bio-char from oil palm empty fruit bunch ([Open Access](#))

(2015) *ISIJ International*, 55 (2), pp. 436-440. Cited 7 times.
https://www.jstage.jst.go.jp/article/isijinternational/55/2/55_436/_pdf
doi: 10.2355/isijinternational.55.436

View at Publisher
-
- 6 Yunus, N.A., Ani, M.H., Salleh, H.M., Abd Rashid, R.Z., Akiyama, T., Purwanto, H.
Reduction of iron ore/empty fruit bunch char briquette composite ([Open Access](#))

(2013) *ISIJ International*, 53 (10), pp. 1749-1755. Cited 21 times.
https://www.jstage.jst.go.jp/article/isijinternational/53/10/53_1749/_pdf
doi: 10.2355/isijinternational.53.1749

View at Publisher
-
- 7 Siddharta, A
(2024) *Production Volume of Iron Ore Malaysia 2012–2021*
[7] Available
<https://www.statista.com/statistics/1132484/malaysia-iron-ore-production/>
-
- 8 Siregar, SRH, Nursani, D, Setyawan, MIB, Surjosatyo, A.
Study of Kinetic and Thermal Decomposition from Municipal Solid Waste Pellets using Model-Fitting Methods
(2021) *IOP Conference Series: Materials Science and Engineering*, 1173 (2021), p. 012033. Cited 3 times.
[8]
-
- 9 Purwanto, H., Salleh, H.M., Rozhan, A.N., Mohamad, A.S., Zakiyuddin, A.
Phase change of iron ore reduction process using EFB as reducing agent at 900-1200°C ([Open Access](#))

(2018) *IOP Conference Series: Materials Science and Engineering*, 342 (1), art. no. 012054. Cited 3 times.
<http://www.iop.org/EJ/journal/mse>
doi: 10.1088/1757-899X/342/1/012054

View at Publisher
-
- 10 Abd Rashid, R.Z., Mohd. Salleh, H., Ani, M.H., Yunus, N.A., Akiyama, T., Purwanto, H.
Reduction of low grade iron ore pellet using palm kernel shell

(2014) *Renewable Energy*, 63, pp. 617-623. Cited 112 times.
doi: 10.1016/j.renene.2013.09.046

View at Publisher