



CENTRO DE INVESTIGACION EN MATERIALES AVANZADOS S.C.
MIGUEL DE CERVANTES 120, COMPLEJO INDUSTRIAL CHIHUAHUA
CIM941025MJ1
CHIHUAHUA, CHIH, CP 31136 TEL. 01 614 439 11 00

PORTAL PARA SUBIR FACTURAS: <http://documentos.proveedores.cimav.edu.mx/>
USUARIO: XEXX4162 CLAVE: 8107ec45

"EN CASO DE QUE LA PRESENTE ORDEN DE COMPRA ESTE SUJETA A UN CONTRATO Y EXISTA DISCREPANCIA ENTRE AMBOS DOCUMENTOS, PREVALECERA LO ESTABLECIDO EN EL CONTRATO"

F. REQ. 07/10/2022	PROVEEDOR: 4162-MDPI ST ALBAN-ANLAGE 66, 4052 BASEL, SWITZERLAND, TEL. 41616837734 FAX. 0	En términos del Artículo 53 de la Ley de adquisiciones, Arrendamientos y Servicios del Sector Público, se aplicará una pena convencional del 1% por cada día de retraso sobre el valor de los bienes no entregados o los servicios no prestados en los términos establecidos en esta orden de compra, la cual se deducirá de su pago. "PARA EFECTOS DEL CÁLCULO DE DÍAS DE ATRASO, SE CONSIDERARÁ A PARTIR DE LA FECHA EN QUE LA ORDEN DE COMPRA SEA COLOCADA"	COTIZACION: CONDICIONES DE ENTREGA: 45 Día (s) CONDICIONES DE PAGO: VS FACTURA TIPO ORDEN DE COMPRA COMPRA DIRECTA NO. DE CONTRATO:
ORDEN DE COMPRA  1A220691			
FECHA ORDEN 14/10/2022			
REQUISICION No. 221077	FAVOR DE CITAR EL NUMERO DE ORDEN DE COMPRA EN TODA SU CORRESPONDENCIA, DOCUMENTOS Y EMPAQUES	ALMACEN O ENTREGA BIENES: ALMACEN	

SOLICITANTE: ZARAGOZA CONTRERAS ERASTO ARMANDO

#	PART.	PROYECTO	DESCRIPCION	CANTIDAD	U/A	PRECIO	IMPORTE
1	21502	20520	MATERIAL PARA INF. EN ACT. DE INVEST. CIENTIF . . . PUBLICACIÓN DE ARTICULO DEL DR. ERASTO ARMANDO ZARAGOZA CONTRERAS EN LA REVISTA MATERIALS DE LA EDITORIAL MDPI TÍTULO: Geopolymers derivated from the wheat husk and curing as- 2 sisted by microwave heating EL COSTO ES DE CHF 2,100.00 FRANCOS SUIZOS (INCLUYE DESCUENTO DE CHF 200.00) EL PAGO SE REALIZARÁ UNA VEZ QUE LA REVISTA MATERIALS DE LA EDITORIAL MDPI ACEPTÉ EL ARTÍCULO Y ENVIARÁ UNA LIGA CON LOS DATOS DE PAGO AL DR. ARMANDO ZARAGOZA. SE ANEXA ESTUDIO DE MERCADO Y JUSTIFICACIÓN ART. 41 FRACCION I.	1.000	PZA	2,100.0000	2,100.00

ESTA ORDEN ESTA REGULADA POR LA LEY DE ADQUISICIONES, ARRENDAMIENTOS Y SERVICIOS DEL SECTOR PUBLICO

FACTURAR A: CENTRO DE INVESTIGACION EN MATERIALES AVANZADOS S.C. CIM941025MJ1
MIGUEL DE CERVANTES 120, COMPLEJO INDUSTRIAL CHIHUAHUA CHIHUAHUA, CHIH, CP 31136 TEL. 01 614 439 11 00
TOTAL EN LETRA (* DOS MIL CIENTO FRANCO, SUIZA 00/100 FRANCO, SUIZA *)

SubTotal FRANCO, SUIZA	2,100.00
IVA	0.00
TOTAL ORDEN	2,100.00

SANCHEZ OLIVAS MARIA AMPARO
DIRECTORA DE ADMON Y FINANZAS

ESCOBEDO LIRA BONIFACIO
JEFE DEL DEPTO. DE ADQUISICIONES

ARAIZA RICO JOEL ARMANDO
SUBDIRECTOR DE FINANZAS



materials

[Submit to Materials](#)

[Review for Materials](#)

Journal Menu

- [Materials Home](#)
- [Aims & Scope](#)
- [Editorial Board](#)
- [Reviewer Board](#)
- [Topical Advisory Panel](#)
- [Instructions for Authors](#)
- [Special Issues](#)
- [Topics](#)
- [Sections & Collections](#)
- [Article Processing Charge](#)
- [Indexing & Archiving](#)
- [Editor's Choice Articles](#)
- [Most Cited & Viewed](#)
- [Journal Statistics](#)
- [Journal History](#)
- [Journal Awards](#)
- [Society Collaborations](#)
- [Conferences](#)
- [Editorial Office](#)

Journal Browser

volume

issue

Open Access and Article Processing Charge (APC)

All articles published in *Materials* (ISSN 1996-1944) are published in full open access. An article processing charge (APC) of **2300 CHF (Swiss Francs)** applies to papers accepted after peer review. This article processing charge is to cover the costs of peer review, copyediting, typesetting, long-term archiving, and journal management. In addition to Swiss francs (CHF), we also accept payment in euros (EUR), US dollars (USD), British pound sterling (GBP), Japanese yen (JPY) or Canadian dollars (CAD).

Local VAT or Sales Tax will be added if applicable.

Submitted papers should be well formatted and use good English. Authors may use MDPI's English editing service prior to publication or during author revisions. Note that many national and private research funding organizations and universities explicitly cover APCs for articles resulting from funded research projects. Discounts are also available for authors from institutes which participate in MDPI's Institutional Open Access Program (IOAP).

Links

- [Article Processing Charges \(APC\) Information](#)
- [Open Access Information and Policy](#)
- [Information for Authors](#)
- [Accepted Methods of Payment](#)
- [Pay an Invoice Now](#)
- [MDPI Invoicing FAQ](#)

Geopolymers derivated from the wheat husk and curing as- sisted by microwave heating

Claudia A. Hernández-Escobar ^{1*}, Alejandro Vega-Rios ¹, José Rurik Farias-Mancilla ² and E. Armando Zaragoza-Contreras ^{1,*}

¹ Department of Engineering and Materials Chemistry; Centro de Investigación en Materiales Avanzados, S.C., Miguel de Cervantes No. 120, Complejo Industrial Chihuahua, Chihuahua 31136 Mexico; alejandro.vega@cimav.edu.mx (A. V.-R.).

² Institute of Engineering and Technology, Autonomous University of the City of Juárez, UACJ, Ciudad Juárez 32310, Mexico; rurik.farias@uacj.mx (J. R. F.-M.).

* Correspondence: claudia.hernandez@cimav.edu.mx (C. A. H.-E); armando.zaragoza@cimav.edu.mx (E. A. Z.-C.).

Abstract: The use of agro-industrial waste such as wheat husk are a sustainable fount of cellulose, lignin, and aluminosilicate; employing these resources to create high-value materials is a methodology to efficiently the process and reduce the pollution footprint. Geopolymers are inorganic polymers constituted by aluminosilicate. These materials have been applicated as cement, refractory bricks, or ceramic precursors for principal uses. In this research, the fly ash from the wheat husk was extracted by calcination at 1100°C. The thermogravimetric analysis revealed that the ash amount in this source was 16 wt%, whereas the atomic ratio of silicon and aluminum was evaluated by elemental analysis (EDAX), indicating 97% silicon and 3% aluminum. With these ashes, geopolymers were obtained by an alkaline activated reaction with sodium hydroxide in concentrations of 8M, 12 M, and 16 M. Subsequently, the comprehensive strength was evaluated in specimens made with curing times of 7, 14, 21, and 28 days, at 20°C. Compression strength indicated at a constant temperature, the resistance increased directly related to alkaline activator concentration and with the curing time, obtaining the best results with the alkaline solutions 16 M. These results suggested that the wheat husk as a source of aluminosilicates can be equally competitive compared to traditional sources in Asia, where the main source of aluminosilicate is rice risk.

Keywords: Geopolymers; wheat husk, microwave.

Citation: Hernández-Escobar C. A.; Vega-Rios A.; Farias-Mancilla J. R.; Zaragoza-Contreras. E. A. Geopolymers derivated from the wheat husk and curing assisted by microwave heating. *Materials* **2022**, *14*, x. <https://doi.org/10.3390/xxxxx>

Academic Editor: Firstname Last-name

Received: date

Accepted: date

Published: date

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2022 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

Geopolymers are a class of inorganic polymers formed by a reaction between an alkaline solution and an aluminosilicate source. Nowadays, geopolymer studies are receiving increasing attention because they may be used as a viable economical alternative to organic polymers and inorganic cement in diverse applications, such as military [1], aircraft [2], high-tech ceramics [3], thermal insulating foams [4], fire-proof building materials [5], refractory adhesives [6], and hybrid inorganic-organic composites [7]. This interest is due to their exceptionally high thermal and chemical stability, excellent mechanical strength, adhesives behavior, and long-term durability. In addition, early research has demonstrated that geopolymers are cheap to produce and can be made from a significant number of minerals and industrial by-products, including natural aluminosilicate minerals [8], metakaolin [9], fly ash [10], and granulated blast furnace slag [11].

The microwave is an alternative heat fount, considerably reducing its action times and, in some cases, the needing that use a solvent, catalysis, or medium [12]. This technology has increased their employment in different industries. The most significant benefit is that it provides it.