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Article

Analysis of the Resistance to Bending of Gypsum with Added Graphene

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Abstract: Gypsum-based interior coatings are used due to their excellent fire resistance and thermal and acoustic properties. In recent decades, the development of these calcium sulfate-based coatings has been linked with the use of new additives that allow the setting times and the water content of the mix to be controlled and offer the possibility of adding different aggregates to the mortar, which further improve its resistance properties. In this article, significant results are presented that compare the flexural strength of mortars formed using added construction plaster with different percentages of graphene powder.

Keywords: gypsum; graphene; resistance; bending; additives

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1. Introduction

Gypsum is a natural stone, called aljez or gypsum stone, composed mainly of calcium sulfate crystallized with two water molecules ($CaSO_4 \cdot 2H_2O$), called calcium sulfate dihydrate or dihydrate. In the dehydration of the stone, the rock should not be subjected to temperatures exceeding 180 °C. Th powdered product obtained from the calcination and grinding of the stone described above is composed of several anhydrous or semi-hydrates of the compound, $CaSO_4 \cdot 2H_2O$, which, when mixed with water, has the ability to harden through a physical-chemical process called setting.

In this developed and globalized world, which has witnessed the development of and advances in many new technological, the research and development of new materials are continuous, mainly existing materials are evolving with the aim of improving their mechanical properties, optimizing their production, or achieving an economic improvement.

The case presented in this work is an analysis of the mechanical properties of calcium sulfate added to a material, such as graphene.

Since graphene was discovered by physicists. Geim and Novoselov, researchers at the University of Manchester, who won the Nobel Prize for their pioneering experiments on the two-dimensional material graphene, have had careers in different institutions, research centers, and universities in relation to the research of this material and its applications. Therefore, we aimed to study whether improvements in the mechanical properties of calcium sulfate are produced using graphene as an additive.

The aim of these additive mortars is to improve various properties, such as workability, increased hardness, and flexural and compression resistance, to achieve an innovative material with more-suitable characteristics for applications in industry, in general, and, specifically, in construction as a material providing continuous interior cladding in buildings for industrial and residential use, as a prefabricated material, or as a substitute for ceramic brick because significantly less CO_2 is emitted in its production.

Examining our current knowledge on topics related to plasters, we found many scientific studies in which different materials were incorporated into plasters to modify and improve some of their physical or mechanical properties. Some of the most outstanding are:

These results are complementary to future Shore C hardness tests; the results of the compressive strength tests of the gypsum and graphene mixture that were previously published [16] in September 2020.

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Abstract

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Abstract

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EDITION
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CATEGORY
MATERIALS SCIENCE, COATINGS & FILMS - SCIE

MATERIALS SCIENCE, MULTIDISCIPLINARY - SCIE

PHYSICS, APPLIED - SCIE

LANGUAGES	REGION	1ST ELECTRONIC JCR YEAR
English	SWITZERLAND	2016

Publisher information

PUBLISHER	ADDRESS	PUBLICATION FREQUENCY
MDPI	ST ALBAN-ANLAGE 66, CH-4052 BASEL, SWITZERLAND	12 issues/year

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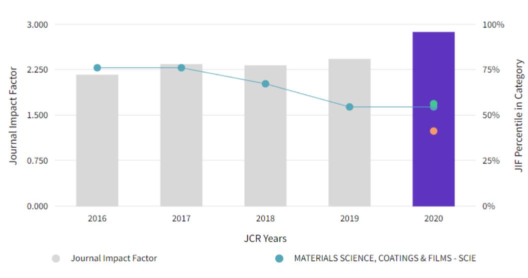

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Thermally Charged MHD Bi-Phase Flow Coatings with Non-Newtonian Nanofluid and Hafnium Particles along Slippery Walls	24
Ultrathin Al2O3 Coating on LiNi0.8Co0.1Mn0.1O2 Cathode Material for Enhanced Cycleability at Extended Voltage Ranges	21
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2019	n/a	n/a	n/a
2018	n/a	n/a	n/a
2017	n/a	n/a	n/a
2016	n/a	n/a	n/a

EDITION
Science Citation Index Expanded (SCIE)

CATEGORY
MATERIALS SCIENCE, COATINGS & FILMS

10/21

JCR YEAR	JIF RANK	JIF QUARTILE	JIF PERCENTILE
2020	10/21	Q2	54.76
2019	10/21	Q2	54.76
2018	7/20	Q2	67.50
2017	5/19	Q2	76.32
2016	5/19	Q2	76.32

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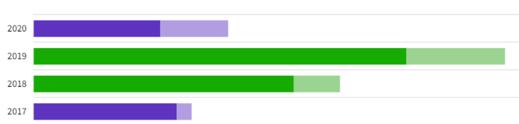
Cited Half-life Data   Citing Half-life Data



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All years	**6,391 citations**	**100.00%**	**1,113 sources**
2020	953 citations	14.91%	255 sources
2019	2,310 citations	51.05%	622 sources
2018	1,501 citations	74.54%	509 sources
2017	774 citations	86.65%	348 sources