Sociedad Mexicana de Ciencia y Tecnología
de Superficies y Materiales A.C.

XI International Conference on Surfaces, Materials and Vacuum

September 24 - 28 2018, Playa del Carmen, Quintana Roo, México

PROCEEDINGS


CONACYT


RedNyN


BENEMÉRITA UNIVERSIDAD AUTÓNOMA DE PUEBLA
1578
BUAP


cimav


IUVSTA


CUCEI


AVS
Sponsored
Topical
Conference
www.avs.org

Sociedad Mexicana de Ciencia y Tecnología de Superficies y Materiales A.C.
XI International Conference in Surfaces, Materials and Vacuum
September 24th-28th , Playa del Carmen, Quintana Roo, México

ORGANIZING COMMITTEE

Gregorio Hernández Cocoletzi
IFUAP

Servando Aguirre Tostado
CIMAV

Emmanuel Haro Poniatowski
UAM-Iztapalapa

Noboru Takeuchi
CNYN-UNAM

Leticia Pérez Arrieta
UAZ

Cristo Manuel Yee Rendón
UAS

Juan Hernández Rosas
UPIITA-IPN

INTERNATIONAL SCIENTIFIC COMMITEE

Michael Springborg
Physical and Theoretical Chemistry, University of Saarland, Germany

Talat S. Rahman, Department of Physics University of Central Florida, USA

Sergio E. Ulloa Department of Physics, Ohio University, USA

Rubén Barrera Pérez Instituto de Física, UNAM, México

Isaac Hernández Calderón
Departamento de Física, CINVESTAV, IPN, México

Pedro Serena
Instituto de Ciencia de Materiales de Madrid, España

PROGRAM COMMITTEE

Advanced and Multifunctional Ceramics
Jesús Heiras Aguirre (CNYN-UNAM)
José Trinidad Elizalde Galindo (UACJ)
Atomic Layer Deposition
Pierre Giovanni Mani González (UACJ)
Edgar López Luna (UASLP)
Eduardo Martínez Guerra (CIMAV-MTY)
Biomaterials and Polymers
César Marquez Beltrán (BUAP)
Amir Maldonado Arce (USON)
Characterization and Metrology
Roberto Machorro (CNYN-UNAM)
Luminescence Phenomena: Materials and Applications
Salvador Carmona Téllez (CICATA LEGARIA-IPN)
Gilberto Alarcón Flores (CICATA ILEGARIA-IPN)
Microelectronics and MEMS
Norberto Hernandez Como (Centro de Nanotecnologia, IPN)
Horacio Estrada, (CIDESI)
Wilfrido Calleja Arriaga, (INAOE)
Nanostructures
Yenny Casallas (UPIITA-IPN)
Esteban Cruz Hernández (CIACYT -UASLP)
Photothermal Phenomena
Mario Enrique Rodríguez (CFATA-UNAM)
Plasma and Vacuum
José G. Quiñones-Galván, (CUCEI, UdeG)
Miguel Ángel Santana-Aranda, (CUCEI, UdeG)
Renewable Energy: Solar Cells and Materials
Issis Claudette Romero Ibarra (UPIITA-IPN)
Mario Fidel García Sánchez (UPIITA-IPN)
Semiconductors
Máximo López (CINVESTAV-DF)
Salvador Gallardo (CINVESTAV-DF)
Surfaces and Interfaces
Leonardo Morales de la Garza (CNyN-UNAM)
Mario Farás Sánchez (CNYN-UNAM)
Theory and Simulation of Materials
Raul Esquivel (IF-UAM)
María Teresa Romero de la Cruz (FCFM-UAdeC)
Ariadna Sanchez (UAEH)
Thin Films
Alberto Duarte Moller, CIMAV-Chihuahua
Tribology
Enrique Camps Carvajal (ININ)
Giovanni Ramirez (Bruker Nano Surfaces)
Science Outreach
Wilfrido Calleja (INAOE),
Dolores García Toral (BUAP)
Josefina Robles Aguilar (BUAP)
Dalia Alejandra Mazón Montijo (CIMAV-Monterrey)

Dear Colleagues,

From the very beginning the Annual Conference of the Sociedad Mexicana de Ciencia y Tecnología de Superficies y Materiales (SMCTSM, Mexican Society of Science and Technology of Surfaces and Materials) has been an important forum used by the Mexican scientific community for the discussion of scientific and technological topics related to research in the areas of surface and materials science.

In these ocation we are pleased to welcome you to participate in the XI International Conference on Surface, Materials and Vacuum (ICSMV) which will held in Playa del Carmen, Quintana Roo 24th to the 28th of September 2018.

The scientific program of the Conference is divided into plenary conferences, short courses and the different symposia with oral and poster contributions. For the XI edition the symposium of Tribology has returned to the program and we have two invited symposia the Atomic Layer Deposition and Luminescence Phenomena: Materials and Applicationsan effort to bring together experiences for people who have successful constructed a relationship with the productive sector. The SMCTSM is also pleased to o joining the celebration of the IUVSTA 60th anniversay by having a series of talks than will empashise both the diverstiy of the research and also the ever growing importance of women in material science. Additionally, to the scientific program, there is a symposium of Science Divulgation which is a traditional forum for the bringing together of students and the general public with the work undertaken and developed within our Society.

We hope that the efforts of the organizing committee, sponsors and colleagues will result in an interesting friendly meeting, providing the opportunity for closer and new interactions between researchers coming from the diverse institutions.

The SMCTM acknowledge the financial support of Consejo Nacional de Ciencias y Tecnologia (CONACYT) for the realization of XI ICSMV.

The XI ICSMV
Organizing Committee SMCTSM
September 2018, Playa del Carmen, Quintana Roo, México.

BIOMATERIALS AND POLYMERS (BIO) ORAL SESSIONS

[BIO-204] Effect of different carbon sources in biogenic calcium carbonate production by Bacillus subtilis 168.

Hector Ferral Perez (hec.ferral@gmail.com)[1], Monica Galicia García[1], Marisela Aguirre Ramírez[1], Bonifacio Alvarado Tenorio[1], Aldo Izaguirre Pompa[2]

[1] Departamento de Ciencias Químico-Biológicas, Universidad Autónoma de Ciudad Juárez, Instituto de Ciencias Biomédicas, Cd. Juárez, Chih., 32310. México.
[2] Departamento de Ingeniería Civil y Ambiental, Universidad Autónoma de Ciudad Juarez, Instituto de Ingeniería y Tecnología, Cd. Juárez, Chih.,32310, México.

Calcium carbonate ($CaCO_3$) is one of the most widely inorganic compounds used in several industries, such as plastics, cosmetics, pharmaceutic, construction and paper. Also, is one of the most abundant mineral in nature, being part of several geocycles, both in marine and lake sediments [1]. $CaCO_3$ mineralization by bacterial metabolism is a promising biotechnological environmental friendly technique to develop new biomaterials. Bacterial $CaCO_3$ mineralization is a phenomenon that occurs in sediments, in caves and even in monuments and buildings [2], [3], [4]. The ability of bacteria to nucleate calcium ions and form minerals is due to the production and nature of exopolymeric substances (EPS) and biofilm geometry [5]. Several investigations have reported differences in mineralizing yield, crystallinity and polymorphic products in different growth condition and species dependence (e.g., strains of *Bacillus licheniformis* and *Lysinubacillus sphaericus* (*B. sphaericus*)) [6]. The purpose of this work is to determine the conditions of $CaCO_3$ crystals production by *Bacillus subtilis* in a semi-solid media supplemented with different carbon and calcium sources.

$CaCO_3$ crystals formation was performed in semisolid media supplement with different carbon source, 2 calcium linked, (calcium acetate and calcium lactate) and 2 calcium not linked, (glucose + $CaCl_2$ and glycerol + $CaCl_2$). Crystals were observed in all conditions since the third incubation-day in semisolid media. The largest produced crystals were observed in glycerol + $CaCl_2$ medium (228±43nm) in contrast to calcium-acetate, glucose + $CaCl_2$ and calcium-lactate media. Diffraction data show that calcite was the prevalent polymorphism in all conditions. The four conditions influenced the crystallinity and the quality of the crystal formed. Crystallite size calculated by Scherrer's equation shows a final crystal grow of 36, 24, 26 and 30 nm for glucose, glycerol, lactate and acetate respectively. Crystallinity index was calculated by mean calcite diffraction peak integration, the highest IC at 9 days was 91% in glucose media. EDS quantification analysis evidenced presence of Ca, O and C as main elemental components, however FTIR analysis show amides, phosphates and sulfur functional groups presence. Those are functional groups constituents in biofilm and exopolymer proteins, amyloids, phospholipids and phosphates sugars [7]. This material surrounds the obtained crystal in all carbon sources, nevertheless, biofilm does not modify mineralized composition. The thermogravimetric analysis showed a difference in the amount of amorphous material produced in all carbon sources, results show that crystals obtained in glycerol carbon sources have the major weight loss (~20%) starting at 296.5 °C. Weight loss indicates organic matter decomposition and probably amorphous calcium carbonate melt point. In all conditions, a second weight loss is observed at 700°C-800°C, which is attributed to $CaCO_3$ decomposition to CaO. Finally, it was determined that *B. subtilis* produces more calcium carbonate crystals, 85% mineralized calcium, in calcium-acetate medium. This work demonstrates that use of different carbon sources coupled to *Bacillus subtilis* 168 can be used as a biological system that can produce calcite with different crystallinity and micromorphology characteristics, that implies an advantage for the applications of $CaCO_3$.

1. *On Biomin* (1989).
2. *Nexo Rev. Cient.* 28, 25–40 (2015).
3. *Of Microb and Art.* (2000)
4. *Appl. Environ. Microbiol.* 78, 1157–1167 (2012).
5. *Earth-Science Rev. 96, 141–162 (2009).*
6. *Appl. Microbiol. Biotechnol*. 100, 9895–9906 (2016).
7. *Int. Biodeterior. Biodegradation* 41, 1–11 (1998).