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Enabling the development of novel devices based on silicon microstructures by adding degrees of freedom to metal assisted chemical etching

by Enrique Quiroga-González

Institute of Physics, BUAP. Puebla, Mexico

Abstract



"Etching is a common process to develop microelectronic devices. It consists of corroding in a controlled manner to sculpt in nano- or micro-sizes. For microelectronics, etching is commonly performed ionically or chemically, allowing to obtain profiles with different levels of anisotropy. Alternatively, one can also etch electrochemically, mainly producing pores; however, these pores can be modulated varying different parameters such voltage, current density, concentration and type of electrolyte, illumination, doping, and temperature.

A similar concept is Metal Assisted Chemical Etching (MACE), which takes advantage of a local electric field, but is an electroless technique. The electric field is generated by a metal-semiconductor junction; etching occurs in the semiconductor at the places where noble metal particles are deposited.

It is a simple inexpensive technique, but it commonly produces just vertical structures. One of the main

research areas of the Energy Lab at the Institute of Physics of BUAP is to add degrees of freedom to the MACE technique. It has been possible to modulate the diameter, shape, and direction of pores, and to produce new structures like micro-cones or nanowires. The new structures have been useful to develop new electronic or biomedical devices, and for energy storage."

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Enrique Quiroga-González studied electronics at the Technological Institute of Hermosillo. He got a master degree in Microelectronics in 2005 at the National Institute for Astrophysics, Optics and Electronics (INAOE), in Tonantzintla, Mexico. In 2010 he received his PhD degree at the Institute for Inorganic Chemistry of the University of Kiel, in Germany. From then, and until December of 2013, he was the leader of battery research at the Institute for Materials Science of the same university, working as staff scientist.

From January 2014 he is Professor at the Institute of Physics of BUAP, in Puebla, Mexico, where nowadays he is the coordinator of the programs of graduate studies on Materials Science. He is the leader of the Energy Laboratory, and of the research group "Low Dimensionality Structures", of the same institution. His main research interests are the synthesis of materials for solar cells and light emitters, and the development of micro- and nano-structures by etching techniques for Energy Storage and Bio-applications. He has published over 60 scientific papers in international journals devoted to these topics.

From March 2017, he is the representative of the Mexican Energy Storage Network.

For more information about projects and publications, you can go to: <http://www.ifuap.buap.mx/~equiroga/en> (<http://www.ifuap.buap.mx/~equiroga/en>)

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64616263005@fr.zmew.us (<mailto:64616263005@fr.zmew.us>)

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/ [Talks \(/index.php/en/events-en/talks-for-members/talks-for-members-2021/26-talks\)](#)
/ [Talks 2021 \(/index.php/en/events-en/talks-for-members/talks-for-members-2021/64-talks/talks-2021\)](#)
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Contact

sfb1261@tf.uni-kiel.de (<mailto:eq@tf.uni-kiel.de>)

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Christian-Albrechts-
Universität zu Kiel (CAU)

Christ.-Albrechts-Platz 4
D-24118 Kiel

UKSH



University Hospital
Schleswig-Holstein,
Campus Kiel (UKSH)

Arnold-Heller-Straße 3
D-24105 Kiel

IPN



IPN - Leibniz-Institut für
die Pädagogik der
Naturwissenschaften und
Mathematik

Olshausenstraße 62
D-24118 Kiel

ISIT



Fraunhofer Institute for
Silicon Technology, Itzehoe
(ISIT)

Fraunhoferstrasse 1
D-25524 Itzehoe