



MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD

AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2013

SECRETARÍA DE ESTADO
DE INVESTIGACIÓN
DESARROLLO E INNOVACIÓN

SECRETARÍA GENERAL
DE CIENCIA, TECNOLOGÍA
E INNOVACIÓN

DIRECCIÓN GENERAL
DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

Nombre: ALVAREZ SANCHEZ, M. MAR
Referencia: RYC-2013-14479
Área Científica: Ingeniería Eléctrica, Electrónica y Automática
Correo Electrónico: mar.alvarez@cin2.es

Título:

Development of biosensors based on micro-electromechanical systems

Resumen de la Memoria:

Mar Álvarez has developed a career focused in the development and transference of technology aimed to production of new and powerful sensing techniques for process optimization and detection of biomolecules at very low concentrations. The core objective of her research line has been aimed to the development of portable and total integrated systems (Lab-on-a-chip) for covering a wide range of applications fields, from environmental to food treatment, genomic or proteomic, looking forward to the technological transfer into useful products for evaluating real samples at point-of-care settings. During her career she gathered an interdisciplinary scientific background, with solid experience at Clean Room's techniques, in the design and fabrication of micro-electromechanical systems (MEMS) and microfluidic for sensing applications; and in the genomic and proteomic fields, with the development of immobilization and bio-recognition protocols specially optimized for particular transducers. Nowadays, she is in charge of the Nanomechanical Biosensors line, at the Nanobiosensors and Bioanalytical Applications Group, where she is mainly focus in the development of micro-electromechanical system (MEMS) based biosensors for the detection of protein, DNA or even single cells, by using two different approaches depending on the detection method (surface stress or resonance frequency). It is a very technological project, which final aim is the development of nanomechanical-based biosensing systems and their integration in lab-on-chip platforms, allowing the detection of several analytes simultaneously. She has developed three main projects, where she pretend solving the current limitations found on this systems when working on the static or dynamic detection methods, which prevent many applications in the biotechnology, environmental or diagnostics fields: i) Cantilever: integration of SPR and surface stress based microcantilever sensors in a single platform, allowing the multiparameter reading of two independent parameters, to achieve a higher understanding of the surface coverage and bending behavior of the microcantilever; ii) Optical cantilever (OWC): biosensing platform based on array of optical waveguide microcantilevers for surface stress detection method. The OWC, where the principle of operation is based on the dependence of coupling efficiency between two butt-coupled waveguides on their misalignment with respect to each other, will simplify and increase the read out alignment integration, for working in static mode; iii) Hollow microbridges (HMB): biosensing platform based on arrays of hollow microbridges for working in dynamic mode. Bridge resonators with embedded microchannels will solve the damping effect when working in dynamic mode under viscous environments, by placing the solution inside the hollow resonators that will be surrounded by air/vacuum, preserving a high quality factor and resolving small mass changes. She is currently supervising 3 PhD Theses. Two of them are in the physics and engineering field; one is related to the OWC project (which will be defended on July of this year) and another one is related to the HMB project. The third one is in the biotechnology area, for the study and optimization of biofunctionalization protocols for photonic multiplexed biosensors, by using ink-jet printing techniques, which has applicability to any kind of biosensor based on silicon or gold technology.

Resumen del Currículum Vitae:

Mar Álvarez obtained her MSc and PhD degrees in Physics from Autonomía University of Madrid, Spain. Before finishing her MSc, in 2000, she joined the Laboratorio de Nuevas Microscopias for the development and optimization of commercial Atomic Force Microscopes (Nanotec). After one year and a half, she joined the Biosensors Group at the Microelectronics National Center (CNM-CSIC) where she developed her PhD on biosensors based on microcantilevers for the detection of biomolecular interactions. She was involved in the organization of the 1st Workshop on Nanomechanical Sensors, held in Madrid in November 2004. After finishing her PhD, in November 2005, she worked at the Clarendon Laboratory at Oxford University (United Kingdom), during a short stay. She was then awarded with the Postdoctoral Spanish Fellowship for a postdoctoral position in a joint project between Swinburne University and MiniFAB Pty Ltd in Melbourne, Australia. Here she worked in the fabrication of microfluidic and bio-handling systems during 6 months. After that, Mar Alvarez accepted a postdoctoral position at the Micro/Nanophysics Research Laboratory, at Monash University (Melbourne, Australia), where she worked, during 17 months, in the development of surface acoustic wave devices for drug delivery. In this period she was also involved in the supervision of Master and Bachelor students. In November 2008, Mar Alvarez joined the Nanobiosensors and Bioanalytical Applications Group at the Research Center on Nanoscience and Nanotechnology (CIN2-CSIC), leaded by Prof. Laura M. Lechuga, where she has worked as Juan de la Cierva and currently as JAE-doc researcher, being in charge of the Nanomechanical Biosensors line. She belongs also to the CIBER-BBN network and was member of the organizing local committee of the Europtrode XI conference hold in Barcelona in April 2012. She is currently co-supervising 3 PhD Theses. Mar Alvarez is coauthor of 21 published papers in journals with impact factors in the first quartile, 10 of them as first author, and 2



MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD

AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2013

SECRETARÍA DE ESTADO
DE INVESTIGACIÓN
DESARROLLO E INNOVACIÓN

SECRETARÍA GENERAL
DE CIENCIA, TECNOLOGÍA
E INNOVACIÓN

DIRECCIÓN GENERAL
DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

chapters in edited books (Human Press and Elsevier Science B.V). She has made important contributions on the nanomechanical biosensors field, publishing in journals such as Biosens.& bioelec., Langmuir, APL, TrAC,..., some of publications being highly cited (for example 125, 114 or 67 cites). She has an h index of 14, with 688 cites in total according to the Web of Science database. She authored two patents, one of which is currently licensed to Mecwins SL. She has been involved in 10 research projects and contributed to more than 30 communications in international conferences, presented in oral and poster sessions, and she is referee of international journals.

Mar Álvarez has developed a career focused in the development and transference of technology aimed to production of new and powerful sensing techniques. During her career she gathered an interdisciplinary scientific background, with solid experience at the clean room technologies, in the design and fabrication of micro-electromechanical systems (MEMs) and microfluidics for biosensing, and the development of immobilization and bio-recognition protocols for specific transducers.



MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD

AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2013

SECRETARÍA DE ESTADO
DE INVESTIGACIÓN
DESARROLLO E INNOVACIÓN

SECRETARÍA GENERAL
DE CIENCIA, TECNOLOGÍA
E INNOVACIÓN

DIRECCIÓN GENERAL
DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

Nombre: ALVAREZ HERVAS, JOSE DOMINGO
Referencia: RYC-2013-14107
Área Científica: Ingeniería Eléctrica, Electrónica y Automática
Correo Electrónico: jalvarez19@us.es

Título:

Control of solar power systems

Resumen de la Memoria:

Throughout the candidate's career and due to his beginning as a Ph.D student in the Solar Platform of Almería (PSA), the main research centre in solar energy in Europe (www.psa.es), most of his research activities have been focused on the modelling and control of renewable power systems, specifically solar power systems. Moreover, the candidate participated during his postdoctoral stage in the singular strategic project about bioclimatic architecture and solar cooling (PSE-ARFRISOL). This project, which was promoted by the Spanish Ministry of Education and Science between 2005-2012, included the collaboration of different kinds of private companies and public institutions. Being a singular strategic project with a total budget of almost 2 million its main goal was to demonstrate the adaptation of bioclimatic architecture and solar energy in public buildings for thermal refurbishment: heating and cooling (www.arfrisol.es/). The involvement in this project has allowed the candidate to apply his knowledge of automatic and control systems in solar energy systems for saving energy in buildings and to start a new research line: the development of control systems for comfort of the buildings' users. At present, the candidate works in the research group Automatic Control and Industrial Robotics (TEP-116) in the University of Seville (US), one of the most important research groups and with more scientific activity inside the TEP area (<https://investigacion.us.es/sisius/grupo/TEP116>) and under the supervision of Professor Eduardo Fernández Camacho the most outstanding researcher in control systems for solar plants. The candidate hopes to continue the research line related to comfort control in buildings in an eventual Ramón y Cajal grant, expanding the obtained results during the PSE-ARFRISOL project for a set of heterogeneous elements such as: buildings, solar energy sources, industry, desalination plants and so on, with the goal of obtaining an efficient management of resources in renewable grids.

Resumen del Currículum Vitae:

The candidate's research results along his career have been published in 19 regular papers in referred journals (18 of them with an impact factor indexed in the Journal Citation Report (JCR), 5 of them in the first quartile of its category and 8 more in the second one). In 7 of this works the candidate is the first author and in 5 of them without any of his Ph.D supervisors. Together with these accepted publications, the candidate has 3 publications more submitted to revision. He has published a book with the results of his Ph.D thesis and other more published in Springer which deals with comfort control in buildings. Moreover, the candidate has almost 30 international and national conference papers, four of them have won an award. In relation to the H index calculated from the citations received: i) in the "Web of Science" database (Databases=SCI-EXPANDED) the candidate has an index $h=4$, and 25 of his most relevant publications have been included which have been cited 59 times, ii) in the SCOPUS database, 27 of his most relevant publications have been included, the candidate has an H index equal to 5, $h=5$, and 90 citations and, iii) finally, in Google Scholar 39 of the candidate's publications appear with a number of 167 citations and the resulting H index is equal to 7, $h=7$. It is important to highlight that many of his publications are new (half of them have been published in 2012 and 2013 or are in press). For this reason the number of citations of these publications is zero or close to it. During his career the candidate has been continuously participating in several research projects obtained in public calls: 6 of them national projects funded by the Spanish Ministry of Science and Innovation.

In his postdoctoral stage the candidate has supervised the formation of 2 Ph.D students, 3 master students and 2 visiting Brazilian students. Moreover, due to his teaching merits, the candidate has obtained the accreditation of tenured lecturer. With respect to his international impact, the candidate has participated in a bilateral project between Brazilian and Spanish universities, as a result of this project the candidate has a stay in the Federal University of Santa Catarina where he can strengthen the relationships with several Brazilian researchers and open new research lines. From this cooperation several papers in referred journals and international congresses have been obtained. Moreover, the candidate is a usual reviewer of several international referred journals and congresses.