



**SUBPROGRAMA RAMÓN Y CAJAL**

**CONVOCATORIA 2022**

**OFERTA DE PLAZAS**

**Solicitante: D/Dª. SONIA MARTÍN LÓPEZ**

**Dpto./Instituto: ELECTRÓNICA**

Comunico que estoy interesado/a en incorporar candidatos del Subprograma Ramón y Cajal, de la convocatoria del año 2022 del Ministerio de Ciencia e Innovación por los siguientes **motivos**: (adecuación a los planes del departamento o grupo, fortalecimiento de nuevas estructuras, potenciación de líneas novedosas o estratégicas y otros aspectos que se consideren de interés):

The activity of the Photonic Engineering Research Group GRIFO of the University of Alcalá is very intense in terms of scientific production. In particular, we work in the research lines of distributed fiber optic sensors, fabrication of materials and devices based on III-nitride semiconductors, and in the development of metasurfaces for energy harvesting systems.

In the last five years, the activity in GRIFO has been very intense in terms of scientific production. In particular, in the research line of distributed fiber optic sensors 2016 was a particularly important year as a new technique for distributed acoustic sensing (DAS) was demonstrated by the group. Since then, this technique has been at the core of many investigations of this group in the last five years, as it offers disruptive properties that have not only spurred the interest of the scientific community, but also from commercial companies which license the patents associated to the technique and have developed it into commercial products (particularly Omnisens, CH, and Aragon Photonics, ES). Different works related to this new technique have been carried out since that moment, diversifying the research line into different sublines, which has made possible the elaboration of different doctoral thesis works as well as obtaining significant funding through different projects and industrial contracts, as well as the generation of several licensed patents which are the ones generating the highest annual revenue in the UAH. Along the years, the group has worked on the study of the intrinsic limits of this technique and has proposed new techniques that try to compensate, correct or overcome these limitations. The previous experience of the members of the research group in Raman distributed amplification has also been used to increase the measurement range of this type of DAS sensors. In the field of applications, the excellent performance of these new sensors has made it possible to explore new uses in a wide variety of fields. In particular, work has been done on the study of these sensors for use as temperature sensors for environments with high concentrations of ionizing radiation. In the line of temperature measurement, the feasibility of the technique for use as a distributed radiometer has been demonstrated in solar energy generation facilities. The measurement of other parameters both external and internal to the optical fiber has also been the subject of study in recent years. For example, the electric field through the Kerr effect and the Pockels effect or the distributed measurement of the fiber birefringence through local variations of the refractive index. Another high-impact application that has been developed in the last five years has been the monitoring of different types of seismic events. In this line, important efforts have been invested in recent years in the research group. The feasibility of using as transducer fiber for the distributed measurement of acoustic signals the optical fiber already installed for communication purposes, makes this technique very attractive for this application. The possibility of replacing traditional seismographs by hundreds of thousands of sensitive points, which will behave as seismographs, by simply installing an interrogator equipment at one end of the sensing fiber, has recently revolutionized this area. A proof of the great interest aroused by the DAS technology developed in the group for this application is the award of the European OCEAN DAS project, awarded to Professor Miguel Gonzalez under the highly competitive ERC Proof of Concept call. Also, very high impact publications have been achieved in this area in the last years. Lastly, the development of pattern identification strategies applied to this type of distributed sensors has been another sub-line in which important results have been achieved in recent years. The challenge of providing artificial intelligence to this type of distributed sensors is of great interest in both research and industry, particularly in ensuring the integrity of pipelines.

VICERRECTORADO DE INVESTIGACIÓN Y TRANSFERENCIA

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<b>Observaciones</b>		<b>Página</b>	1/3
<b>Url De Verificación</b>	<a href="https://vfirma.uah.es/vfirma/code/xI3IF8xzrQo7BwJe4MaKTg==">https://vfirma.uah.es/vfirma/code/xI3IF8xzrQo7BwJe4MaKTg==</a>		
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In regard to the rest of the group's research lines, the group has been developing interesting works in the field of development and fabrication of materials and devices based on group III nitrides. Related to this subject, the main developments have been:

o Study of the non-linear properties and applications of group III nitrides and development of new structures for optical switching, optical limiting and saturable absorbers at optical communications wavelengths. The main application of this research line is the development of fiber-based ultrashort pulsed lasers with high stability and high output power. This development is being carried out in within the framework of public research projects and companies.

o Sensors and solar cells based on group III nitrides. Including the electrical and optical design, layer deposition, device implementation and optimization of structures for applications in the visible and near-infrared spectrum; as well as the application of strategies to increase efficiency in solar cells, including layers based on photonic elements. In this field, nitrides offer a tunable direct band gap and high stability in harsh environment, with direct applications in the space field. Design of surface nanostructures for the optimization of thin-film solar cells.

o Design and validation of fiber optic sensors based on Surface Plasmon Resonance (SPR). Design and validation of polymer fiber optic sensors based on fluorescence of GADOX compounds doped with Eu or Tb for the detection and quantification of ionising radiation: Rx and Ry.

o Fabrication of microfibers for temperature detection using Fourier Transform techniques.

o Frequency multiplexed systems for the multiple detection of interferometric sensors.

In summary, the research group GRIFO has published more than 55 articles in scientific journals of recognized prestige, most of them in the first decile of the JCR ranking. An irrefutable proof of the great interest aroused by the results of this research is the remarkable number (15) of invited papers in the most prestigious national and international conferences in the field. In terms of funding, more than 3 M€ have been obtained in competitive calls for proposals and close to 500,000 € in contracts with industry.

The Photonics Engineering Research Group has an outstanding research career in the field of Photonics, recognised on numerous occasions through personal recognition obtained by its members in the field of research and postdoctoral training. In particular, three researchers (Dr. M. Rosario Fernández Ruiz, Dr. Sirona Valdueza Felip and Dr. Sonia Martín López) have developed or are developing their activity in GRIFO within the Ramón y Cajal programme in the last ten years, which has allowed the group to increase its resources in order to expand its research lines.

Potential researchers funded under this program who join GRIFO will enjoy the advantages of belonging to a consolidated "Alto Rendimiento" research group in terms of facilities and resources. They will be able to develop their research activity autonomously and independently in a dynamic research environment, with great international projection. In addition, the group will support them to participate in national and European funding calls, which will allow them to develop their work in an economically autonomous way.

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<b>Observaciones</b>		<b>Página</b>	2/3
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Perfil investigador requerido de los candidatos:

Candidates should preferably have some experience in one of the research lines described in the previous section, although a researcher who could complement the group's current research with new research lines would be very welcome.

In particular, the main lines of research in which candidates would find the most support within the GRIFO group would be:

- Development of Distributed Optical Fiber Sensors
- Study of the non-linear properties and applications of group III nitrides and development of new structures.
- Development of fiber optic sensors based on Surface Plasmon Resonance (SPR)
- Design and development of solar cells and related surface nanostructures to optimize their performance.

And any other complementary research line that could complement to the previous ones.

Persona de contacto: Sonia Martín López

Dónde desea que se cuelgue su oferta en:

- Oferta específica de plazas de Departamentos  
 Oferta específica de plazas en Grupos de Investigación

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Alcalá de Henares, de de 2023

Solicitante

Vº Bº Director/a del Dpto/Instituto

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