FICHA DE PROYECTO

TÍTULO DEL PROYECTO:
Geles nanocompuestos para la purificación de aguas mediante calentamiento magnético

TITLE OF THE PROPOSAL *(en inglés)**:***
Gel-nanocomposites for magnetic-mediated heating assisted water purification

ACRÓNIMO DE LA ACTUACIÓN:
GELTHERM

RESPONSABLE PRINCIPAL:
Pablo Guardia

CONSORCIO:
No

ÁREAS DE IREC IMPLICADAS:
Functional Nanomaterials

DURACIÓN DEL PROYECTO:
01/09/2019 - 31/08/2022

CONVOCATORIA:
Programa Estatal de Investigación, Desarrollo e Innovación Orientada a los Retos de la Sociedad, convocatoria de 2018. Modalidad JIN.

OBJETIVO DE LA CONVOCATORIA
Esta actuación tiene como finalidad la contribución a la solución de los problemas sociales, económicos y tecnológicos orientados hacia la búsqueda de soluciones a los retos de la sociedad, mediante la publicación de sus resultados en foros de alto impacto científico y tecnológico, transferencia de tecnología y la internacionalización de las actividades.

REFERENCIA:
RTI2018-102006-J-100

ABSTRACT:
The project GELTHERM addresses one of the greatest challenges of the 21st century defined in the Plan estatal de investigación científica y técnica y de innovación 2017-2020 (Reto 5): Providing water universally in a safe, reliable and affordable manner. This challenge is also included in the EU Horizon 2020 Work Program 2018-2020 Climate action, environment, resource efficiency and raw materials CE-SC5-04-

2019. GELTHERM solution to this challenge is based on the development of novel materials and the application of novel strategies and technologies for water remediation. In particular, the project aims to develop magnetic-activated multifunctional nanocomposite gels as a platform for multiple activated water treatments: ion removal, dye degradation, oil spill clean-up and pathogen inactivation. As such, a unique absorbent material can be exploited to eliminate a range of pollutants, thus reducing the complexity and costs associated to traditional water purification systems. To achieve this ambitious goal, the project will exploit gelation processes to combine different nanoscaled building blocks (several types of nanoparticles and graphene oxide nanosheets) into highly porous structures (gels or aerogels). Multifunctionality will be provided by combining nanoparticles having photocatalytic activity, magnetic response, biocidal activity and selective adsorption capability. Embedding magnetic nanoparticles into gels will allow for magnetic mediated heating (MMH) and the use of hyperthermia for purification (i.e. pathogen inactivation or foulant degradation). MMH combined in standard purification procedures will boost the performances: Ion-absorption and desorption capacities, photocatalytic dye degradation and pathogen inactivation, absorption and desorption of oil spills and molecules, and biocidal release can be boosted well beyond the current-state-of-the-art through local increase of the temperature by MMH. Moreover, since MMH is a contactless process, it can be exploited for triggering each process thus providing both selectivity and remote control over the purification treatment. Finally, the magnetic response will provide magnetic extraction, improving the reuse of the absorbent material and limiting unintended release to the environment. The nanocomposite gels developed will be also exploited as sensing platforms for water pollutants in collaboration with external groups.

The technology developed during the project will be directly applied in a gravity filter prototype to be further implemented in a cartridge filter for a water purification pitcher. The final goal of the project is to provide a point-of-use water purification system for areas in which water security is scarce or water-supplying systems are inefficient. Outcomes of the project will find further applications in industrial, agriculture and urban wastewater management. As such, the project have a huge potential impact in society by: i) decreasing diseases and deaths related with contaminated water, ii) decreasing wastewater management costs through faster and efficient purification processes, iii) the restoration of aquatic ecosystems and iv) providing point-of-use water purification systems for undeveloped areas.

AGENTE FINANCIADOR:
Ministerio de Ciencia, Innovación y Universidades (MICIU), la agencia estatal de investigación (AEI) y el Fondo Europeo de desarrollo Regional (FEDER).