New palette of smart materials for soft robotics applications

Ester Vázquez

Universidad de Castilla-La Mancha, Instituto Regional de Investigación Científica Aplicada (IRICA), Avda Camilo José Cela, 13071, Ciudad Real, Spain
Ester.vazquez@uclm.es

The synthesis of different hydrophilic polymeric networks, by in situ radical polymerisation in the presence of graphene derivatives, results in soft three-dimensional structures. The role of the nanomaterial within the polymeric network is mainly reinforcement (i.e. increased stiffness and toughness). However, we have shown that the presence of graphene can also enhance characteristics such as biocompatibility [1], sensing [2] or self-healing behaviour [3], giving rise to truly hybrid composites [4]. In addition, the ability of these materials to respond to different stimuli, such as electrical fields, and the possibility of preparation following 3D printing methodologies, opens the way to applications in soft robotics.[5]
These structures require 2D materials that are easily dispersible in water, and for this reason, sustainable mechanochemical methods developed in our laboratories have proven their utility for the preparation of the starting materials.[6]

References

[1] C. Martín, S. Merino, J. M. González-Domínguez, R. Rauti, L. Ballerini, M. Prato, E. Vázquez, Scientific Reports, 7, (2017), 10942.
[2] I. Payo, J. L Polo, B. López, D. Serrano, A. M Rodríguez, M. A. Herrero, A. Martín-Pacheco, I. Sánchez, E. Vázquez, Smart Mater. Struct., 31, (2022), 015020,
[3] A. Naranjo, C. Martín, A. López-Díaz, A. Martín-Pacheco, A. M. Rodríguez, F. J. Patiño, M. A. Herrero, A. S. Vázquez, E. Vázquez, Applied Materials Today, (2020), 100806.
[4] C. Martín, A. Martín-Pacheco, A. Naranjo, A. Criado, S. Merino, E. Díez-Barra, M. A. Herrero, E. Vázquez, Nanoscale, 11, (2019), 4822.
[5] A. López-Díaz, A. Martín-Pacheco, A. M. Rodríguez, M. A. Herrero, A. S. Vázquez, E. Vázquez, Adv. Func. Mater., (2020), 2004417.
[6] J. M. González-Domínguez, V. León, M. I. Lucío, M. Prato and E. Vázquez. Nature Protocols, 13, (2018), 495.

Figure