Graphene-based composite supercapacitors for enhanced capabilities

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Energy storage devices are key in multiple technologies of interest for the security and defence sectors such as hybrid and electric vehicles, mobile communications, portable and wearable electronics, smart sensors and internet of things. Graphene offers an outstanding material platform for enhancing the capabilities of these devices not only in terms of specifications but also in versatility, as it can be incorporated into flexible substrates and textiles.

In this presentation, various graphene-based supercapacitor technologies using composite hierarchic electrode structures will be presented [1-5]. The graphene porous scaffolds are fabricated either by chemical vapor deposition of graphene on sacrificial 3-dimensional metal foams or by laser-driven conversion of compact graphene oxide layers into 3-dimensional open networks of exfoliated flakes of reduced graphene oxide. These scaffolds are then functionalized with nanostructured pseudo-capacitive materials including conducting polymers and metal hydroxides. The unique combination of high specific surface area and outstanding electrical and mechanical properties of the graphene porous scaffolds and their composites offers new possibilities in energy storage devices.

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References

[1] J. Pedrós, A. Boscá, J. Martínez, S. Ruiz-Gómez, L. Pérez, V. Barranco, F. Calle, Journal of Power Sources 317 (2016) 35–42
[2] J. Pedrós, A. Boscá, J. Martínez, F. Calle, S. Ruiz-Gómez, L. Pérez, V. Barranco, A. Páez, J. García, WO 2016/066843 A1; US 2017/0237075 A1
[3] S. Ruiz-Gómez, A. Boscá, L. Pérez, J. Pedrós, J. Martínez, A. Páez, F. Calle, Diamond & Related Materials 57 (2015) 63–67
[4] A. Páez, J. García, F. J. Alía, V. Barranco, E. Climent, A. de Andrés, J. M. Rojo, J. Pedrós, J. Martínez, A. Boscá, F. Calle, WO 2017/202824 A1
[5] A. Ladrón-de-Guevara, A. Boscá, J. Pedrós, E. Climent-Pascual, A. de Andrés, F. Calle, J. Martínez, Applied Surface Science 467–468 (2019) 691–697