[P2.106]

Multifunctional carbon nanotube composite fibers: Properties and electronic textile applications

J.A. Benedico[1], R. Marcilla[2], E. Azaceta[3], A. Seral-Ascaso[1], E. García-Bordejé[1], M. Laguna[4], V.L. Cebolla[1], R. Garriga[5], E. Muñoz*[1]

[1]Instituto de Carboquímica ICB-CSIC, Spain, [2]Institute IMDEA Energy, Spain, [3]IK4-CIDETEC, Spain, [4]Universidad de Zaragoza-CSIC, Spain, [5]Universidad de Zaragoza, Spain

Remarkable progress in the fabrication of carbon nanotube composite fibers has resulted through the development of the wet-spinning technique pioneered by Vigolo *et al.* [1] This process implies the fabrication of gel fibers as a result of the collapse of surfactant-stabilized carbon nanotube dispersions when injected into a coagulation bath. When dried, those gel fibers become solid fibers with high carbon nanotube contents (≥ 50 wt.%), significantly higher than those achieved by other fiber spinning technologies, such as melt-spinning or electrospinning.

We here report how this wet-spinning method provides carbon nanotube composite fibers with tunable properties, which mainly depend on the composition of the coagulation bath used. Polymers including polyvinyl alcohol (PVA) [2-5] and polyethylenimine (PEI) [6] have been here investigated as coagulants.[7] Remarkable transport-, supercapacitor- and electrochemical actuation properties are demonstrated for these coagulation wet-spun fibers, that can be woven into fabrics and therefore offer promise for a variety of electronic textile applications [2-4].

This work has been funded by the Fundación Domingo Martínez (Ayuda a la Investigación 2013).

[1] B. Vigolo, A. Pénicaud, C. Coulon, C. Sauder, R. Pailler, C. Journet, P. Bernier, P. Poulin, Science, **290** (2000) 1331.

[2] A. B. Dalton, S. Collins, E. Muñoz, J. M. Razal, V. H. Ebron, J. P. Ferraris, J. N. Coleman, B. G. Kim, R. H. Baughman, Nature, **423** (2003) 703.

[3] A. B. Dalton, S. Collins, J. Razal, E. Muñoz, V. H. Ebron, B. G. Kim, J. N. Coleman, J. P. Ferraris, R. H. Baughman, J. Mater. Chem., **14** (2004) 1.

[4] E. Muñoz, A. B. Dalton, S. Collins, M. Kozlov, J. Razal, J. N. Coleman, B. G. Kim, V. H. Ebron, M. Selvidge, J. P. Ferraris, R. H. Baughman, Adv. Eng. Mater., **6** (2004) 801.

[5] J.M. Razal, J.N. Coleman, E. Muñoz, B. Lund, Y. Gogotsi, H. Ye, S. Collins, A.B. Dalton, R.H. Baughman, Adv. Funct. Mater., **17** (2007) 2918.

[6] E. Muñoz, D.-S. Suh, S. Collins, M. Selvidge, A. B. Dalton, B. G. Kim, J. M. Razal, G. Ussery, A. G. Rinzler, M. T. Martínez, R. H. Baughman, Adv. Mater., **17** (2005) 1064.

[7] R. Marcilla et al., submitted.

Keywords: Carbon nanotubes, Composites, Electronic textiles