LASER ABLATION PRODUCTION OF METAL-DOPED NANOSTRUCTURED CARBON FOAM

A. Seral-Ascaso,[1] E. Muñoz,[2,] M. L. Ruiz-González,[3] M. L. Sanjuán,[1] J. M. González-Calbet,[3] M. Laguna [1], and G. F. de la Fuente[1]*

[1] Instituto de Ciencia de Materiales de Aragón (Universidad de Zaragoza-CSIC), Zaragoza. Spain.

[2] Instituto de Carboquímica (CSIC), Miguel Luesma Castán 4, 50018 Zaragoza. Spain

[3] Departamento de Química Inorgánica I, Facultad de Ciencias Químicas, Universidad Complutense, 28040 Madrid. Spain.

edgar@icb.csic.es

Laser ablation of carbon-containing materials has been demonstrated as a convenient method for the preparation of carbon-based nanostructures [1]. A particular example is the production of single-walled carbon nanotubes by laser irradiation of metal-doped graphite targets [2]. Important laser parameters such as wavelength, pulse repetition rate, laser fluence (pulsed- or cw mode) or irradiance, as well as other experimental conditions (mainly atmosphere composition and pressure, target composition and external or laser-generated heating) strongly affect the recombination of the evaporated species and, therefore, the nature and properties of the produced materials, eventually resulting in efficient carbon nanotube production processes [3].

The present work thus pretends to illustrate the potential of using selected organometallic precursors for the tailored production of metal-doped nanostructured carbon foams. Laser ablation of the employed organometallic precursors leads to the formation of soots exhibiting a spongy texture as a consequence of the aggregation of particles whose diameters range between 20 and 40 nm, as shown in the scanning electron microscopy (SEM) image depicted in Fig. 1 (left). Transmission electron microscopy (TEM) studies reveal that these materials consist of metal nanoparticles embedded in carbon matrices comprising both amorphous carbon and graphitic nanostructures (Fig. 1, right). A new family of carbon nanostructured materials can be thus envisioned by employing the simple, versatile laser ablation technique described in this work [4].

References:

[1] A.V. Rode, S.T. Hyde, E.G. Gamaly, R.G. Elliman, D.R. McKenzie, S. Bulcock, Appl. Phys. A, **69** (1999) S755.

[2] W.K. Maser, E. Muñoz, A.M. Benito, M.T. Martínez, G.F. de la Fuente, Y. Maniette, E. Anglaret, J.L. Sauvajol, Chem. Phys. Lett., **292** (1998) 587.

[3] E. Muñoz, W.K. Maser, A.M. Benito, M.T. Martínez, G.F. de la Fuente, A. Righi, J.L. Sauvajol, E. Anglaret, Y. Maniette, Appl. Phys. A, **70** (2000) 145.

[4] E. Muñoz, M. de Val, M.L. Ruiz-González, C. López-Gascón, M.L. Sanjuán, M.T. Martínez, J.M. González-Calbet, G.F. de la Fuente, M. Laguna, Chem. Phys. Lett., **420** (2006) 86.

Figures:

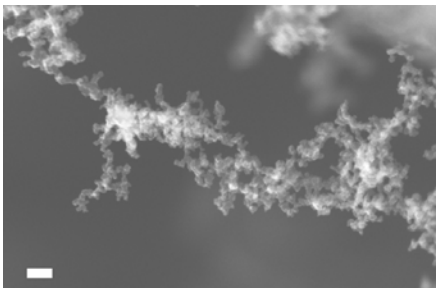
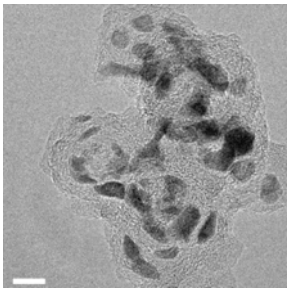

Fig. 1. SEM-(left) and TEM (right) micrographs of laser-ablation produced Au-doped carbon foams [4].