PRESS RELEASE

Best student poster award at SJNANO2012 for a work on thermal diffusivity of polymeric samples fabricated in the frame of the CONSOLIDER project nanoTHERM.

Bellaterra (Barcelona), Spain, 16 December 2011.

Begoña Abad, a Ph.D. student at IMM Marisol Martín's group, recently won the best student poster award at SJNANO2012, the first bilateral Spanish/Japanese school/workshop on nanotechnology and new materials with environmental challenges. Her poster presented the first measurements of thermal diffusivity on polyaniline and nanoclay-embedded polyaniline samples fabricated by Leitat Technological Center in the frame of the CONSOLIDER project nanoTHERM.

In the search of cleaner source of energy, thermo-electrical materials are good candidates for cost-effective energy harvesting. The mechanical flexibility of polymers makes them material of interest and among them polyaniline is promising for its intrinsic properties: high electrical conductivity, ease of processing, simple doping chemistry and environmental stability. The incorporation of nanoclays in the polymer is expected to act as phonon dispersive centers, reducing the thermal conductivity without affecting the electrical properties, thus increasing the figure-of-merit ZT.

In this work, the thermal diffusivity of the polyaniline and polyaniline with nanoclays has been studied, using a new experimental set-up at IMM developed under NANOTHERMA project. The novel experimental set-up is based on the steady-state method and used to obtain the thermal diffusivity of the different bulk thermoelectrics materials, which is a property not easy to measure. This system has been cross-checked with a very expensive commercial system, called laser flash, proving its reliability. Moreover, the novel system presents the advantage of being completely non-destructive, whereas the laser flash measurement of the sample resulted in the surface damage of the PANI.

The thermal diffusivity is directly related with the thermal conductivity following $\alpha=\kappa/\rho C_e$. The new experimental set-up designed and build at IMM was able to measure the thermal diffusivity of PANI and nanoclay-embedded PANI samples. Leitat Technological Center measured their respective specific heat, C_e, by Differential Scanning Calorimetry which allowed the determination of the thermal conductivity. It was shown that compared to PANI samples, the thermal conductivity of MMT-embedded or SEP-embedded PANI samples was reduced by a factor of 1.85 or 2.18 respectively. According to the literature, the thermal diffusivity of PANI prepared by LEITAT is on the order of the values observed. However, thermal diffusivity of PANI-composites

has not been measured until now showing the expected reduction of thermal diffusivity with the nanoclays content.

Motivated by these good results on the thermal properties, the research is now focusing on the Seebeck coefficient and the electrical conductivity. However, they need further improvement to be considered as thermoelectric commercial material.

About nanoTHERM

(www.nanotherm.es)

The nanoTHERM project consortium is composed of nine Spanish teams from academia, technology centres and industry; the Catalan Institute of Nanotechnology, the Polytechnic University of Catalonia, the CSIC Institute of Materials Science of Barcelona, the University of Valencia, LEITAT Technological Centre, the Autonomous University of Barcelona, the CSIC National Centre for Metallurgical Research, the Basque Country University and the CSIC Microelectronics Institute of Madrid. The latter will join the consortium in 2012.

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