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5th World Congress on
Materials Science & Engineering
June 13-15, 2016 Alicante, Spain

Conducting polymers as an alternative for classical thermoelectric materials

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More than two thirds parts of the energy that is produced is lost as heat losses. In consideration of that, it is crucial to find effective ways to recover all this loss energy. The use of thermoelectric materials make possible to recover all this energy due to the Seebeck effect. In the last few years, several intrinsically conducting polymers (ICPs) have been successfully used in the field of thermoelectricity. The dimensionless figure of merit ZT ($ZT=S^2\sigma T/\kappa$) where S, σ and κ are the Seebeck coefficient, the electrical and thermal conductivities, respectively, has been improved several orders of magnitude, until values very close to those of inorganic materials. Polymers show, in addition, many advantages over inorganic materials, such as: non scarcity of raw materials, lack of toxicity, lower cost of production and many others. In this work, the focus is to provide several routes to increase the thermoelectric efficiency of conducting polymers such as: chemical and electrochemical de/doping or the incorporation of nanofillers to the polymer matrix. Using these methods it is possible to achieve a ZT > 0.2 for ICPs. In addition, a new method for the fabrication of thermoelectric modules (TEG) has been developed using only one type of ICP. As a proof of concept, we have developed a thermal sensor based on poly(3,4 ethylenedioxythiophene) (PEDOT) nanofilms as thermoelectric material.

Biography

Mario Culebras Rubio obtained a degree in Chemistry from the University of Valencia in 2011. After he obtained a Master in Science and Technology in Colloids and Interfaces, he started his PhD studies in 2012 under direction of Andres Cantarero, about “Organic thermoelectric materials” in the University of Valencia. Currently, he has published several papers about thermoelectricity in polymeric and carbonaceous materials.

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