

Titania-Graphene Composites for Thermoelectric Applications

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Transition metal oxide ceramics such as titanium dioxide, TiO_2 , are free of the common drawbacks of telluride high performing TE materials (high toxicity, high cost) and are stable at high temperatures ($>500^\circ\text{C}$), being therefore attractive for printable thermoelectric TE application [1].

One of these transition metal oxide ceramics is titanium dioxide, TiO_2 , which widely used in photocatalysis, dye-sensitized solar cells, lithium ion batteries [2].

The main issue about using TiO_2 is its low electrical conductivity. There are some methods to improve the electrical conductivity, using dopant like Nb [2], tuning the stoichiometry of oxygen [3], making composite with carbon fillers [4]. Here, we presents our results with formulations based on titania powder and ethylcellulose as a binder and Graphene nanoplate as a filler.

To obtain the best thermoelectric performance, the ratio between graphene and TiO_2 was tuned and the different size of TiO_2 were used.

References

- [1] Scientific reports 6 (2016): 36581
- [2] J. Phys. Chem. C 2013, 117, 11487–11497
- [3] APPLIED PHYSICS LETTERS 91, 052505 2007
- [4] Applied Physics A (2018) 124:38

Figures

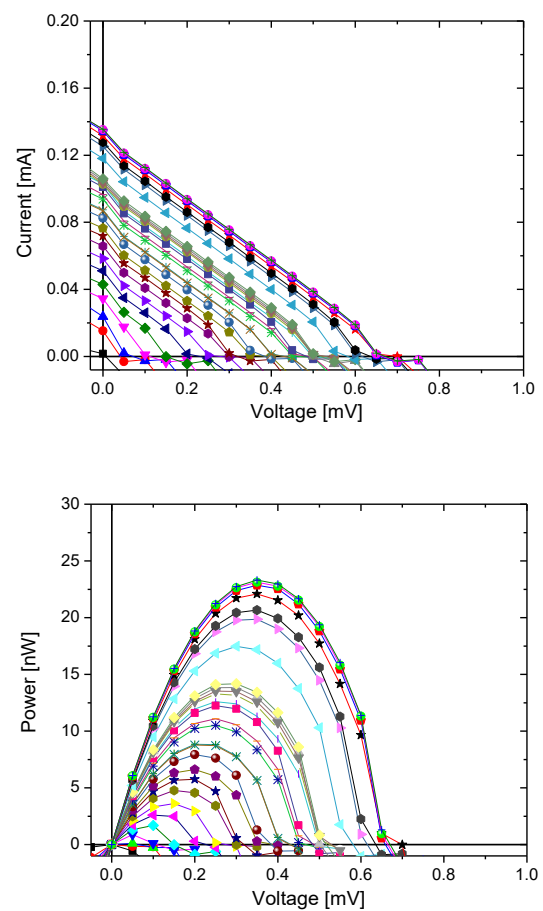


Figure 1: IV vs temperature (top) and P-V vs temperature curves (bottom) of Titania-Graphene composites