

Annotations of Doctoral Thesis Topics for Degree Programme “Nanotechnology and Advanced Materials”

Topic: Non-conventional production of self-powered sensors

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Annotation:

The objective of this thesis is to merge Powder Injection Molding (PIM) and Additive Manufacturing (AM) for the production of self-powered sensing systems. Various post-consumer plastic waste originating from packaging applications will be used for electricity generation by piezo-tribo-pyro electrifications representing sustainable solution for an alarming plastic pollution. Harvesting and self-powered sensors endorse new functionalities of unsorted waste without incorporation of potentially hazardous materials as fluoropolymers. The solutions will be sensitive to detect the stimulus in real time, repeatably and durably.

Requirements:

Candidate should have a MSc. degree in material science or polymer/metal/ceramic engineering; good knowledge of mathematics and physics required, fluent English writing and practical skills in injection moulding appreciated. A person respecting ethics and willing to gain knowledge.

Literature:

1. Kalali, E. N., Lotfian, S., Shabestari, M. E., Khayatzadeh, S., Zhao, C., & Nezhad, H. Y. (2023). A critical review of the current progress of plastic waste recycling technology in structural materials. *Current Opinion in Green and Sustainable Chemistry*, 40, 100763. <https://doi.org/10.1016/J.COGSC.2023.100763>
2. Slobodian, P., Olejnik, R., Matyas, J., Riha, P., Hausnerova, B. 2023. A coupled piezo-triboelectric nanogenerator based on the electrification of biaxially oriented polyethylene terephthalate food packaging films. *Nano Energy*, 118, 108986. <https://doi.org/10.1016/j.nanoen.2023.108986>.
3. R.M. German, Powder Injection Moulding. 1st Ed, Metal Powder Industries Federation, Princeton (1995)