

FUNCTIONALLY GRADED AUXETIC COMPOSITES AND STRUCTURES

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ABSTRACT

Functionally graded materials (FGM) are an advanced type of composites characterized by their continuously varying microstructure, thus providing a smooth properties' variation without interfacial stress concentrations [1] and a relevant function of thermal barrier [2].

In parallel, auxetic materials, due to their negative Poisson's ratios, are known to possess very interesting material characteristics, such as greater shear and fracture resistance, which lead to high impact resistance, energy absorption, and damping [3].

The potential synergy between auxetic materials and FGM promotes innovative design solutions characterized by advanced geometrical and material characteristics well beyond the ones achieved using conventional materials [4].

This Thematic Session aims to highlight the recent advances in the broad scope of the optimal modelling of auxetic and functionally graded composites and structures, as well as with their manufacturing.

REFERENCES

- [1] P.S. Ghatage, V.R. Kar and P.E. Sudhagar, "On the numerical modelling and analysis of multi-directional functionally graded composite structures: A review", *Composite Structures*, 236, 111837, 2020.
- [2] M. Koizumi, "FGM activities in Japan", *Composites Part B: Engineering*, 28, 1–4, 1997.
- [3] X. Ren, R. Das, P. Tran, T.D. Ngo, and Y.M. Xie, "Auxetic metamaterials and structures: A review", *Smart Materials and Structures*, 27, 023001, 2018.
- [4] C. Qi, F. Jiang, S. Yang, "Advanced honeycomb designs for improving mechanical properties: A review", *Composites Part B: Engineering*, 227, 109393, 2021.