

## **Additive manufactured composite smart structures with embedded fibre Bragg grating sensors (AMCSS)**

the National Science Centre, Poland & Research Council of Lithuania  
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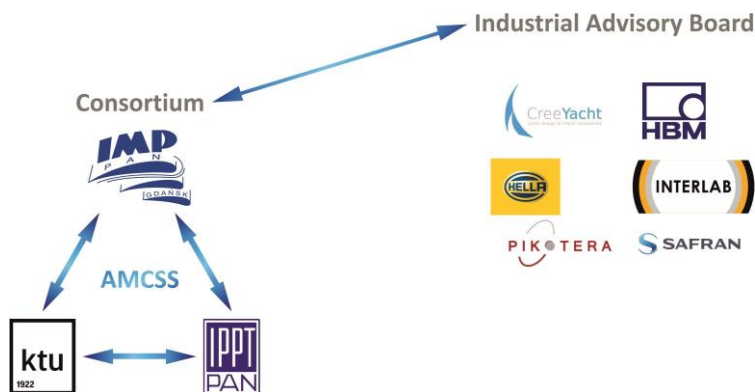
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### Consortium:

**Institute of Fluid Flow Machinery, Polish Academy of Sciences (IMP PAN), Poland**

- ✓ FBG sensors and environmental tests of AM composite materials

**Institute of Fundamental Technological Research of the Polish Academy of Sciences (IPPT PAN), Poland**

- ✓ modelling of AM composite samples

**Kaunas University of Technology (KTU), Lithuania**

- ✓ manufacturing of AM composite samples with embedded FBG sensors and mechanical tests of manufactured materials

**Industrial Advisory Board**

- ✓ connecting science and industry

### Aim and objective of the project

- ✓ development of high performance composites – additive manufactured (AM) carbon/ glass fibre reinforced polymers (CFRP/ GFRP) with embedded fibre Bragg grating (FBG) sensors
- ✓ development of AM method for embedding FBG sensors into CFRP/ GFRP materials during the manufacturing process
  - ✓ modified fused deposition modelling – simplicity and achieving a composite structure with good adhesion effect and reduced the possibility of delamination occurrence
- ✓ composites manufactured with embedded FBG sensors to analyse the embedded fibre optics influences on material durability
  - ✓ mechanical analyses – tensile, flexural, compression, shear, and fatigue tests
  - ✓ environmental tests – negative/ elevated temperature, moisture, and UV radiation

Publications:

- 1) Shafighfard, T., & Mieloszyk, M. (2021). Model of the Temperature Influence on Additively Manufactured Carbon Fibre Reinforced Polymer Samples with Embedded Fibre Bragg Grating Sensors. *Materials*, 15(1), 222  
<https://www.mdpi.com/1996-1944/15/1/222>
- 2) Kuncius, T., Rimašauskas, M., & Rimašauskienė, R. (2021). Interlayer adhesion analysis of 3d-printed continuous carbon fibre-reinforced composites. *Polymers*, 13(10), 1653  
<https://www.mdpi.com/2073-4360/13/10/1653>
- 3) Shafighfard, T (2021). Additively manufactured composite structures with fibre Bragg grating sensors [in] *Selected problems in mechanical engineering 2021*, IMP PAN Gdansk, 215-243, ISBN 978-83-66928-00-8  
[https://www.imp.gda.pl/fileadmin/doc/imp\\_announcements/imp\\_doctoral\\_school/2021/monografia\\_inzynieria\\_mechaniczna\\_2021.pdf](https://www.imp.gda.pl/fileadmin/doc/imp_announcements/imp_doctoral_school/2021/monografia_inzynieria_mechaniczna_2021.pdf)
- 4) Mieloszyk, M., Majewska, K., Andrearczyk, A., Rimasauskiene, R., Rimasauskas, M. & Orłowska, A. (2022). The thermal influence on additive manufactured composite with fiber Bragg grating sensor [in] *Health Monitoring of Structural and Biological Systems XII*, International Society for Optics and Photonics, in-press