

CEIPEX BUT TOPIC 3

Položka / Field	Obsah / Content
CEIPEX RESEARCH TOPIC LEVEL 1	Advanced Nano & Micro technologies
CEIPEX RESEARCH TOPIC LEVEL 2	Future energy
NAME OF THE RESEARCH GROUP	Future Energy & Innovation Lab (RG-1-18)
SUPERVISOR	Prof. Martin Pumera
PROPOSED RESEARCH TOPIC TITLE	Additively Manufactured Sensors for Crop & Plant Health Monitoring
RESEARCH TOPIC DESCRIPTION	Additively Manufactured Sensors for Human, Animal, and Crop Health Monitoring This research topic aims to develop affordable, customizable sensors for monitoring and improve human health in broad spectra - improving crop health through additive manufacturing and advanced functional materials. The research should combine printable conductive composites, functionalized electrodes, and integrated sensing platforms to enable rapid measurements at the point of need. The central focus will be the design and fabrication of electrochemical sensors using carbon-based materials, two-dimensional nanomaterials, conductive polymers, and hybrid composites. Additive manufacturing will enable tailored electrode geometries, flexible device formats, and integration with microfluidic sampling systems. Surface modification and selective recognition elements will be explored to improve sensitivity, selectivity, and resistance to fouling in complex biological and environmental samples. For crops, sensors will address plant stress markers, nutrient availability, and harmful contaminants in plant-associated samples, soil extracts, and irrigation water. Specific targets will be selected according to biological relevance, sampling feasibility, and analytical performance requirements. Research should address reproducibility, calibration, mechanical durability, and long-term stability, with validation against established analytical methods. Where appropriate, compact electronics and wireless readout shall support repeated measurements and accessible data interpretation. The expected outcome is a versatile set of validated sensor prototypes and manufacturing approaches that connect materials innovation with practical monitoring needs. The topic supports earlier identification of health problems, more informed interventions, and efficient resource use across healthcare and precision agriculture.
KEYWORDS	3D printing, sensing, biosensing, health
INTERDISCIPLINARY DIMENSION	Spanning from electronics, manufacturing, advanced materials and biological sciences

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WEBPAGE OF THE RESEARCH GROUP	https://www.ceitec.eu/future-energy-and-innovation/rg322/about-us