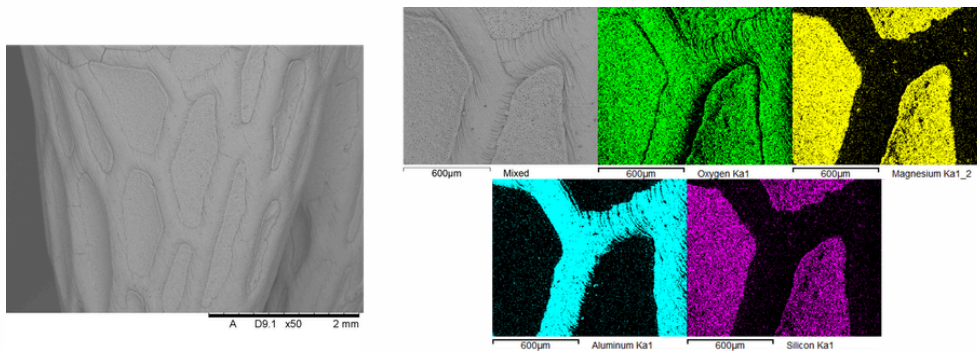




# ADDITIVE MANUFACTURING OF CUSTOMIZED CERAMIC DENTAL IMPLANTS SUBSEQUENTLY JOINED WITH BIODEGRADABLE METAL CORES

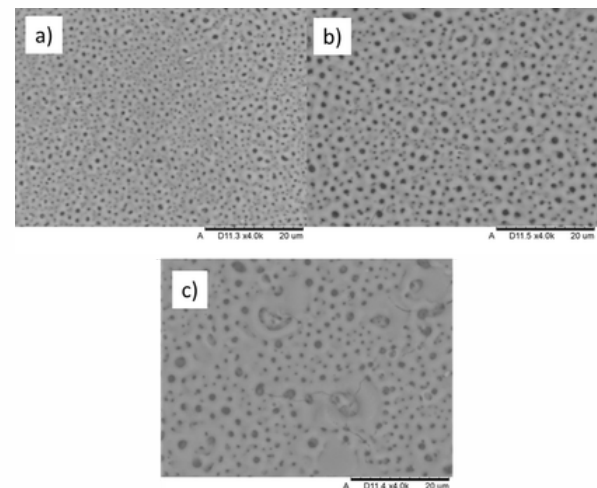
## -NEWSLETTER 5-

During the project's third year of realization, the remaining tasks were fulfilled. As for the composites characterization the emphasis was put on the mechanical properties assessment and completion of thermal expansion tests, also for subsequent infiltrated composite samples with TPMS (gyroid) cores. Bending strength was investigated reaching a maximum stress of even over 110 MPa for the strongest sample. Improvement in CTE has also risen, being of maximum 4.1 times lower than the one for pure Mg.



PEO-coated composite tooth (SEM view of the root and EDS mapping)

PEO layers formation was further elaborated considering various process parameters and their effect on coatings morphology, tendency to cracking and corrosion behaviour. Additional assesment of the degradation process in physiological conditions was conducted during tests using phosphate buffered saline (PBS) solution. Among considered variables the following main ones were studied: treatment mode (unipolar or bipolar), current density, processing time and electrolytes with bioactive compounds. Presence of the oxide coating on the surface on magnesium alloy has substantially increased the corrosion resistance, what translates into reduced decomposition rate. Moreover, the coating, in the tested range does not have a significant negative influence on either thermal stability or bending strength. Another metal alloy was also utilized for testing belonging to the Mg-Zn-Ca system to ensure chemical composition not harmful to human organisms joined together with satisfactory corrosion resistance.



Mg-3Zn samples PEO-coated after etching: a) for 300 s, b) for 600 s, c) for 760 s (visible increase of pore size for longer deposition periods)

Some of the results mentioned here were presented during speech „Dental implants produced by Mg-alloy infiltration of ceramic scaffolds” at XXXI. international conference of casters from Poland, Czech Republic and Slovakia SPOLUPRÁCA · SPOLUPRÁCE · WSPÓŁPRACA 2025 (2-4.04.2025, Rajecké Teplice, Slovakia) and as a poster “Characterization of PEO-coated multi-material composites for dental applications” during 34th Annual Conference of the European Society for Biomaterials (ESB 2025) (7-11.09.2025, Turin, Italy).