

**Doctoral School of Information and Biomedical Technologies
Polish Academy of Sciences (TIB PAN)**

SUBJECT:

Injectable composite hydrogels in the regeneration of cartilage

(the detailed title will be clarified as a result of the PhD student-promoter interaction)

SUPERVISOR:

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DESCRIPTION:

Cartilage is a unique hypocellular, aneural, alymphatic, and avascular tissue composed of chondrocytes embedded within a dense extracellular matrix (ECM) of collagens, proteoglycans, and non-collagenous proteins. Absence of neural, lymphatic, or vascular supply makes regeneration of articular cartilage extremely difficult. Articular cartilage injuries, commonly caused by sports and recreational activities, are a major risk factor for development of osteoarthritis (OA), an inflammatory and degenerative joint disease characterized by the degradation of the cartilage. The classical treatment procedures used are still imperfect, and modern biomaterials dedicated to the regeneration of this tissue are a very promising direction. Injectable hydrogels are of particular interest here, as they allow for effective regeneration of damaged cartilage in a minimally invasive manner. The subject of the work would be injectable composite hydrogels filled with polymer nanofibers formed by electrospinning. Such material systems, suitably optimized, create a complementary whole in view of various properties that allow for effective regeneration of cartilage. Research will include the formulation of such materials, structural and property studies, and in-vitro cellular response studies.