

STEM CELL PROCESS ENGINEERING

RANGE OF SERVICES

Material development

- Development and adaptation of innovative materials for stem cell applications
- Cytocompatibility studies of materials or substances with stem cells
- Development and adaptation of physiological cell culture surfaces (e. g. elastic, biochemical signals)

Stem cell processes

- Transfer of customer-specific expansion and differentiation protocols to scalable mini bioreactors
- Development and evaluation of automation solutions for stem cell processes
- Implementation of data infrastructures for material developments and cell-based processes
- Development of customer-specific stem cell applications, in particular the production of model systems, toxicity tests and bioprinting
- Consultancy on quality management within the framework of ISO 9001

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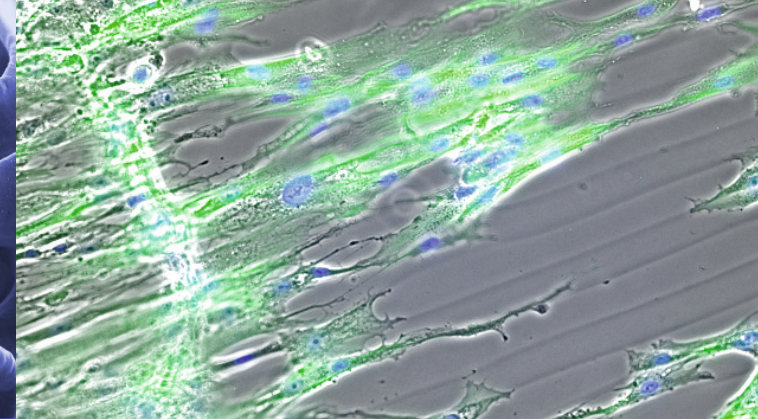
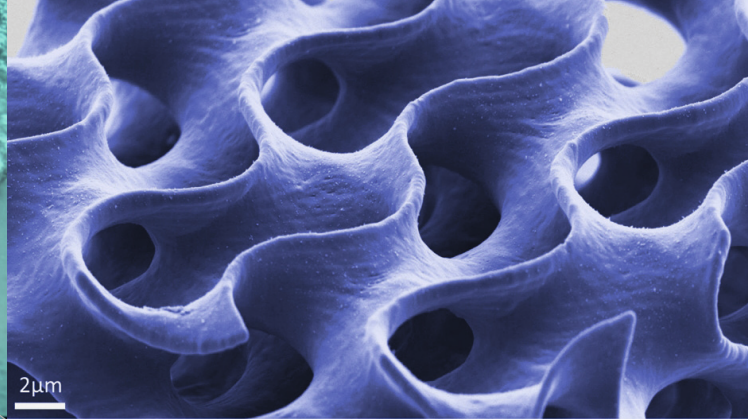
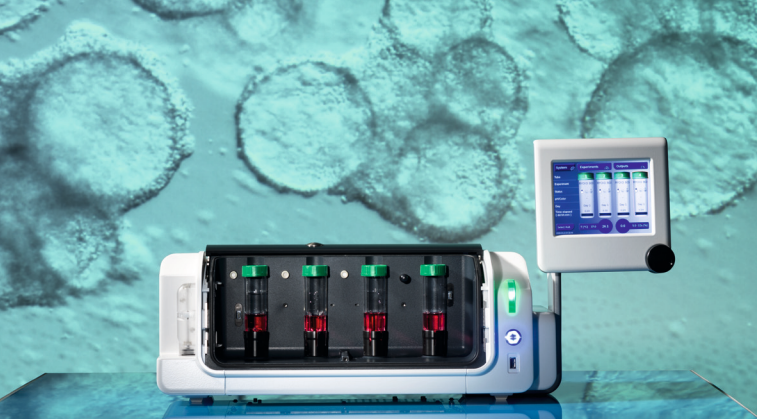
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THE PROJECT CENTER FOR STEM CELL PROCESS ENGINEERING

The Project Center for Stem Cell Process Engineering SPT in Würzburg brings together the complementary competences of the core institutes Fraunhofer Institute for Biomedical Engineering IBMT and Fraunhofer Institute for Silicate Research ISC. It forms a nationally and internationally visible competence center in the area of stem cell process engineering in combination with innovative materials in the Free State of Bavaria. The goal is to transfer stem cell processes to an industrial scale with the aid of automation solutions, and to improve them with innovative materials in the field of cell expansion, cell differentiation and cryopreservation.

The material science competence of the Fraunhofer ISC and the competence of the Fraunhofer IBMT in the automation of biomedical workflows in the field of iPS cells are bundled at a single location. This means that the project center offers an integrated portfolio for the development of application-specific, high-throughput production processes for stem cell applications. The project center brings together a unique combination of research and development in the field of material innovations for bioreactors, tissue-engineering scaffolds and innovative autonomous cell production.

MATERIAL DEVELOPMENT

The project center SPT has extensive competence in the field of development of hybrid polymeric, inorganic and (multi) functional materials. Highly specialized biomaterials with switchable surfaces for the stimulation of adherent cells are as much part of the technology portfolio as micro- and nano-carriers or beads for cell colonization and separation and as encapsulation systems. The material portfolio is rounded off by 3D-structured scaffolds of hybrid polymers that have structural sizes in the range of just 50 nm based on two-photon polymerization (2PP), and contain material-integrated trigger mechanisms for the release of active ingredients. In addition to this, state-of-the-art characterization methods are available both for the biological evaluations and for the material characterization from the accredited Center of Applied Analytics (ZAA). They offer an understanding of the physical and chemical interactions that is essential for the development of new/optimized materials.

Current material development focuses on

- 3D-micro-/nano-surface structures of biomimetic materials, e. g. for in-vitro test systems
- Smart materials: active optical | electric | magnetic materials
- Innovative encapsulation systems

STEM CELL PROCESS ENGINEERING

- Protocols for the cultivation and differentiation of human stem cells (multipotent stem cells, pluripotent stem cells)
- Development of automation strategies for workflows in stem cell biology
- Compatibility studies of cell culture surfaces / cell cultivation systems with stem cells
- Protocols for the cultivation and differentiation of stem cells in suspension bioreactors
- Production of alginate-based microcarriers
- Production of physiological cell culture surfaces with hydrogels
- Bioactivation of surfaces for stem cell cultivation
- Development of stem cell-based model systems for, for example, active ingredient development or toxicity studies
- Broad spectrum of analytical methods for pluripotent stem cells and specialized cells (qPCR, FACS, ICC, SEM)
- Non-invasive, automated cell analysis using microscopy images
- Data management and analysis of biological samples