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GEFÖRDERT VOM
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HAWK

PLASMA FOR LIFE

INNOVATIVE SOLUTIONS FROM SOUTHERN LOWER SAXONY

SCIENTIFIC BOARD
PERSONAL WISHES/THOUGHTS AND IDEAS

PROF. DR. WOLFGANG VIÖL

As partnership spokesperson and project manager, I hope that many new things will be explored, that numerous new products will emerge from this and that these will also be implemented for the benefit of the population, so that this will become a real success story, especially for the region.

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PROF. DR. CHRISTOPH GERHARD

As project manager of the „NeDia“ impulse project, I expect both new scientific findings and the practical implementation of this knowledge gain in usable processes and products in the fields of optical diagnostics and medical technology.

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DR. BERND SCHIECHE

As cluster manager, I am particularly looking forward to discovering and inventing further product and process innovations and intensifying cooperation with our current and other new partners in the coming years.

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PROF. DR. CHRISTOPH RUßMANN

As dean of the Health Campus and project leader of „PhyWo“, an exploratory project, I look forward to exploring acoustic/photo-acoustic methods in the field of medical technology for targeted drug delivery to diseased areas of the retina.

E-Mail: christoph.russmann@hawk.de

PROF. DR. THOMAS LINKUGEL

As project leader of the „Precise“ exploratory project, I am looking forward to using collaborative robotics to research and develop innovative solutions for the individual plasma treatment of complex workpieces.

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DR. ANDREAS HELMKE

As the scientific coordinator of „Plasma for Life“, I am happy about how all the participants from science and industry employ such constructive, highly motivated and goal-oriented working methods, which form the basis for successful innovation processes in the region.

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THE „PLASMA FOR LIFE“ PARTNERSHIP

Targeted networking and strategic cooperation with companies, complementary research partners and other professional associations are of central importance as a core task for the cluster management for the technology-oriented “Plasma for Life” partnership at HAWK. In the intensification phase from 2021 to 2025, the primary goal is to establish and expand close, sustainable cooperations with predominantly regional companies – all along the value-added chain in the upstream and downstream sectors of the healthcare industry. Sustainable impulses in terms of research, development and innovation (R&D&I) for the location, the region and beyond in the form of innovative solutions will be realized primarily through “optical technologies” – linked with robotics for the purposes of exploration.

HIGHEST-LEVEL GOALS OF THE PARTNERSHIP

- Exploiting the potential of „optical technologies“: plasma, UV, laser
- Positioning as an innovation driver in the upstream and downstream sectors of the healthcare industry
- Technology transfer with our partners: From lab via fab to patients

ADVANTAGES FOR YOU AS A PARTNER

- Contacts to professors and researchers
- Latest information from research, the partnership and the HAWK-faculty
- Increased visibility, especially for SMEs
- Opportunities to recruit young talent
- Networking: Contact to cooperation and research partners
- Voice for the partners
- Information on current financial aid programs and calls
- Specialist presentations at companies
- Knowledge exchange
- Inspiring partnership meetings

ADDED VALUE FOR YOU AS A CLUSTER PARTNER

- Sustainable level of trust and connections to the other partners (b-to-b contacts)
- Economic impact for Germany and particularly for the goettingen region
- Exchange of specific information and (expert) knowledge
- Flexibility with respect to further cooperations
- High speed for exchange and communication of findings

IMPULSE PROJECT
ENVIRONMENTAL IMPACT

The primary goal of this impulse project is to reduce the amount of plastic in the environment. With the rapid increase in the world population, along with supply processes and packaging, plastic waste has become a significant environmental problem. For example, microplastic has already found its way into the human food chain. This project focuses on treating paper with plasma to improve its properties. In this way paper can be used to replace plastic films in the packaging sector.
The thin-film technology used here makes it possible to produce extremely thin layers of the highest quality.

CONTENTS

- Expanding the range of uses for paper and cardboard through plasma treatment so that they can replace plastic packaging

GOAL

- Development of plasma coating technologies and systems for the innovative, resource-friendly application of hydrophobic and barrier coatings

IMPLEMENTATION

- Set-up of a roll-to-roll system
- Set-up of specific process analytics
- Test series for paper coating

AREAS OF APPLICATION

- Packaging industry
- Plasma system construction
- Paper manufacturers

IMPULSE PROJECT INNOPRAEV
INNOVATIVE PREVENTATIVE MEASURES

Preventive measures often focus on hygienic measures, which in many areas are designed to inactivate or decontaminate such pathogens as bacteria, fungi and viruses. The need for procedures that are effective as quickly and broadly as possible has become enormously important in recent decades, since resistance to antibiotics is developing in bacteria in everyday hospital life, among other things, to an increasing extent and serious courses of disease and deaths are growing continuously. As a result, this project aims to improve hygiene through the use of plasma-modified aerosols and/or mobile plasma sources.

CONTENTS

- Use of plasma-based equipment and processes in the vicinity of hygiene-sensitive areas

GOAL

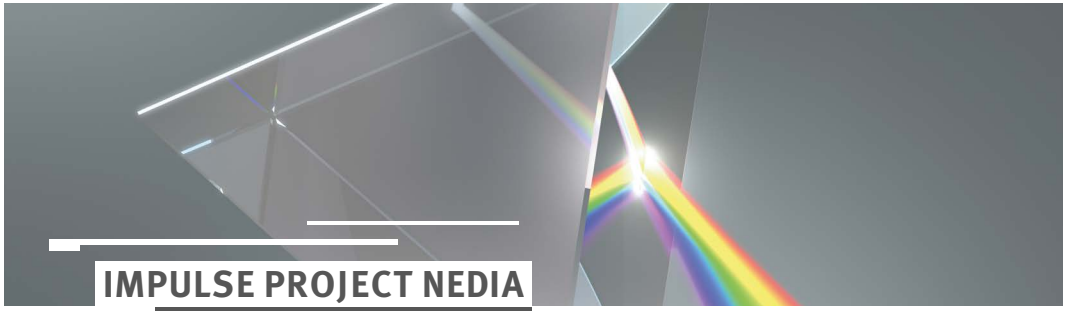
- Reduction of air, water and surface contamination through the use of plasma

IMPLEMENTATION

- Conception, design and construction of equipment and process prototypes
- Execution of different test series for the reduction of microorganisms
- Systematic analysis of application potentials for the degradation of VOCs and airborne bacteria and viruses

AREAS OF APPLICATION

- Surface hygiene in sensitive areas, including laboratories, patient rooms, health centers
- Oral hygiene
- Reduction of airborne pollutants



IMPULSE PROJECT NEDIA
NOVEL DIAGNOSTICS

Challenges in the production of fine optical components with respect to precision cleaning, surface post-treatment and finishing are everywhere. New solutions and processes are needed to comply with quality assurance measures and to increase production sustainability. The „Novel Diagnostics“ impulse project aims to make contributions to both technical improvement and better economic availability of optical diagnostic systems for medical technology and biomedical research.

CONTENTS

Research into technical solutions for
- precision cleaning
- surface passivation
- surface activation

for the field of optical diagnostic systems

GOALS

- Creation of system solutions for novel joining processes
- Development of adapted cleaning and production processes

IMPLEMENTATION

- Measurement-based surface and contamination analyses
- Use of plasmas for cleaning/activation

AREAS OF APPLICATION

- Precision optics production
- Medical technology

IMPULSE PROJECT NATEV
NOVEL THERAPY METHODS

This impulse project is designed to conduct research into plasma-based product innovations for medicine and cosmetics as well as plasma-assisted physiotherapies. These approaches to new treatment methods will be made available to medical professionals and therapists in the healthcare system.

CONTENTS

Research
- into new therapeutic potentials in physiotherapy
- as the basis for plasma-based product innovations for the treatment of the skin and for the chemical-free treatment of head lice infestation, for example

GOALS

- Development of novel, plasma-based approaches for medical and cosmetic products
- Identification of new approaches in physiotherapy

IMPLEMENTATION

- Development of plasma-based skin overlays
- Research into the synergistic effects of plasma-assisted physiotherapy
- Development of a plasma-based lice comb

AREAS OF APPLICATION

- Medicine
- Physiotherapy
- Cosmetics

IMPULSE PROJECT PATIVERS
PATIENT CARE

The impulse project is dedicated to the innovative surface modification of materials in the field of medical patient care. To do so, the project uses plasma source concepts developed in-house and (V)UV lamps with different wavelengths and compares them with one another.

CONTENTS

- Creation of a process library for the performance of plasma and (V)UV processes on a wide range of technical materials
- Development of technical solutions and PECVD processes for the disinfection and germ reduction of textile surfaces
- Application of layer systems

GOAL

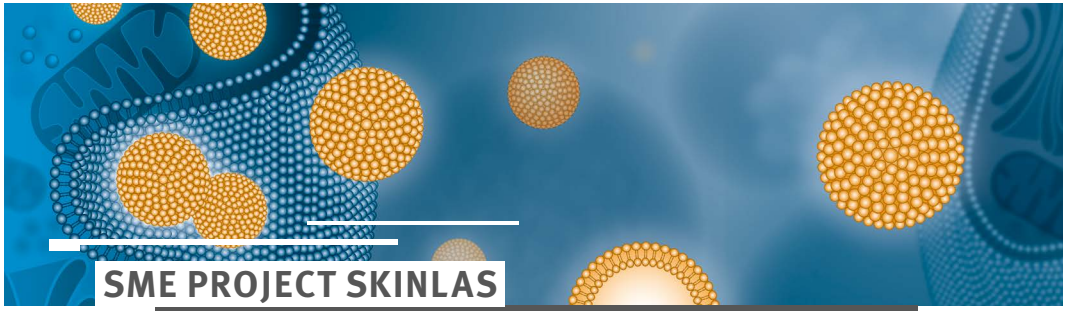
- Realization of different device prototypes and processes

IMPLEMENTATION

- Execution of extensive test series
- Design and construction of device and process prototypes
- Extensive surface analysis

AREAS OF APPLICATION

- Surface activation and modification
- Layer systems to meet barrier requirements
- Reduction of contaminants on special textiles



SME PROJECT SKINLAS
EXOSOME ISOLATION FOR A WOUND SPRAY

The biology of plasma-assisted treatment of large-area burns or in scar treatment, for example, is already quite well understood. Since about 2003, project partner IBA Lifesciences GmbH has been developing an innovative technology that completely detaches and removes the cell isolation reagents after the isolation of the cells. This provides a highly pure cell product that has already been tested in a successful phase I/II clinical evaluation in Germany for the treatment of CMV infections. Since about 2020, work in developing the first reagents for the isolation of exosomes (extracellular vesicles) has also been successful. This has laid the foundations for applying cells or even exosomes in the form of a spray to large-area wounds after plasma treatment, thereby significantly accelerating the wound healing process.

CONTENTS

- The studies in the murine system were successfully completed
- Murine cells could be applied with high viability in scratch assay
- Start of transfer to the human system
- Two Fab-TACS® reagents successful to date

GOALS

- Significant reduction of wound treatment time through the use of a cell or exosome spray
- This results in shortened inpatient treatments and the reduction of treatment costs

IMPLEMENTATION

- Development of a low-cost cell sprayer on the basis of commercial spray devices
- Testing of the use with and transfer to murine keratinocytes and fibroblasts
- Development of Fab-TACS® reagents for exosome isolation
- Scratch assay evaluation as a wound healing model

AREAS OF APPLICATION

- Treatment of large-area wounds in combination with cold plasma treatments in human medicine, veterinary medicine and organ-on-a-chip (skin model)

EXPLORATORY PROJECT PRECISE
DIGITIZATION/ROBOTICS

The explorative project “PRECISE-[P]lasma extended [r]obot for [e]nhan[c]ed [i]ntelligent [s]urface [e]diting” devises solutions for the individual plasma treatment of workpieces with complex geometry. To achieve this goal, a source of cold atmospheric pressure plasma is fully integrated on a collaborative robot and equipped with an optical object recognition system. This makes it possible to fully automate the entire process of material and surface treatment of workpieces and to guide the plasma sources precisely and with consistent reproducibility. This is made possible in particular by feeding the plasma process parameters back into the control process.

CONTENTS

- Workpiece and motion detection through high-precision optical recognition systems
- Increased accuracy of the robot arm based on the feedback of plasma process parameters
- DBD plasma sources operated and studied for the first time on an industrial robot

GOALS

- Workpieces with complex geometry can be treated with DBD plasma fully automatically

IMPLEMENTATION

- Development of an optical object and motion detection system
- Exploration of plasma process parameters
- Increasing dynamic robot path accuracy
- Workpiece recognition using AI

AREAS OF APPLICATION

- Surface activation of small, medium and especially larger surfaces in the industrial sector
- Automated disinfection of surfaces, objects and rooms

EXPLORATORY PROJECT PHYWO
PHYSICAL PROCEDURES IN OPHTHALMOLOGY

This project aims to compare the method of „focused ultrasound“ (FUS) for the temporary, non-invasive opening of the blood-retina barrier (BRB) with laser-induced pressure waves for the purpose of improved passage of drugs or for the development of new treatment options. In addition, two-photon excitation (2P) will be explored for drug release. Either approach can be used on its own or in combination.

CONTENTS

- Opening of the blood-retinal barrier by means of „focused ultrasound“ (FUS) and laser-induced pressure waves
- Two-photon excitation for drug release

GOALs

- Improved therapies in ophthalmology, e. g. age-related macular degeneration and diabetic retinopathy

IMPLEMENTATION

- Construction of FUS prototypes based on simulation calculations
- Measurement of FUS and laser-induced pressure waves in tissue phantoms
- Photochemical characterization of light-inducible molecules
- Determination of a suitable parameter range for drug release

AREAS OF APPLICATION

- Medical technology

CO-FINANCING CORPORATE PARTNERS

ASSOCIATED CORPORATE PARTNERS

RESEARCH PARTNERS

NETWORK PARTNERS