Case Study

THE FOURTH STATE OF MATTER

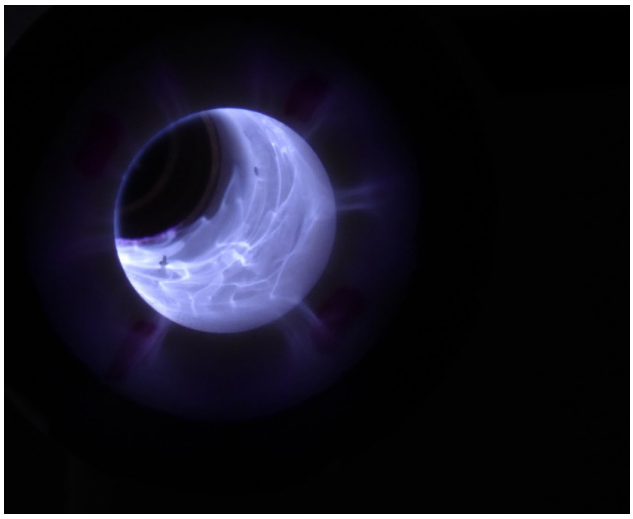
National Biofilms Innovation Centre

Helping industry find academic partners to explore new applications for a known technology

Fourth State is a micro-SME with ambitions of becoming a leading global provider of atmospheric pressure plasma solutions in healthcare and other adjacent markets. Plasma is the 'fourth state of matter' and consists of ionised gas. Examples in nature include lightning strikes, the aurora and the sun, while historical technological applications include etching of silicon chips for smartphones, advanced space propulsion systems and controlled nuclear fusion reactors. The company founders, Dr Thomas Frame and Dr Thomas Harle, saw an opportunity to use their technological expertise in spacecraft systems engineering and applied plasma physics to address urgent terrestrial needs, such as antimicrobial resistance. The team has since developed and patented an innovative platform plasma technology, and developed the company's first product, Nebulaskin®, for non-surgical cosmetic procedures with a number of leading Harley Street clinics. A disruptive wound care product is currently in development.

Dr Harle said, "Fourth State sees biofilm management and prevention as a future 'killer app' for plasma technology across a wide range of sectors, so it's fantastic to be working with NBIC to accelerate development and market access for the technology. Access to NBIC Proof of Concept funding has allowed us to build out our network, explore the expansion of our technology into further sectors and provide us with a deeper understanding of the science behind the interaction of plasma and biofilm".

Dr Velliou said, "I find the broadness of the NBIC network and remit fascinating. It allows the conduction of so many different types of research on biofilms and enables academics to network with other relevant groups at both national and international level and encourages academics to work directly with industry to drive solutions to practical problems through fundamental research. This interaction is very valuable as we really see our research output accelerated from bench to every-day practice in industry".



Fourth State's technology harnesses plasma (ionised gas) for biofilm management and prevention.

Project Summary

In the food industry, increased resistance of biofilm-forming bacteria such as Listeria has led to a need for new approaches for decontamination of food and food processing surfaces. This collaboration between Fourth State and the University of Surrey will evaluate the efficacy of Fourth State's innovative plasma (ionised gas) technology for biofilm prevention and management on food and hard surfaces.

Dr Eirini Velliou, Principal Investigator

Dr Eirini Velliou is Senior Lecturer (Associate Professor) of Bioprocess & Tissue Engineering, Principal Investigator and Founder of the Bioprocess and Biochemical Engineering group (BioProChem) in the Department of Chemical and Process Engineering at the University of Surrey. Her research focus falls within the engineering and validation of novel biomaterial based in vitro platforms for studying various biological systems and diseases, i.e., cancer, stem cells expansion and differentiation, formulation and communication of bacterial communities and bacterial-host interactions.