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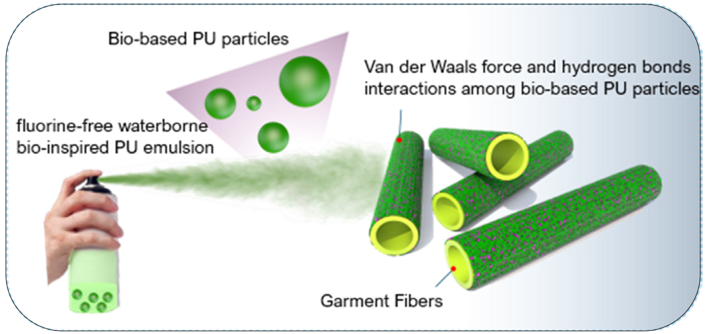
Fluorine-Free, Liquid-Repellent Coating for future CBRN garment

This project addresses the challenge of developing fluorine-free repellency options for CBRN protective garments. By focusing on eco-friendly fabric coatings with robust liquid repellence and air permeability, it tackles environmental concerns linked to fluorine-based agents. This contributes to enhancing defense capabilities and safety.

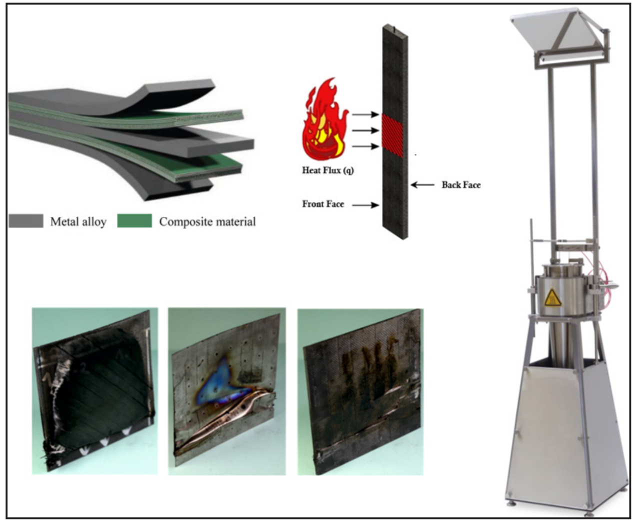


The overall aims of the project is to deliver a scalable, modified fluorine-free waterborne bio-inspired polyurethane, designed for use as a hydrophobic coating on various fabrics in military textiles. It will serve as the outer layer finish for CBRN garments, while also maintaining air-permeable coveralls.

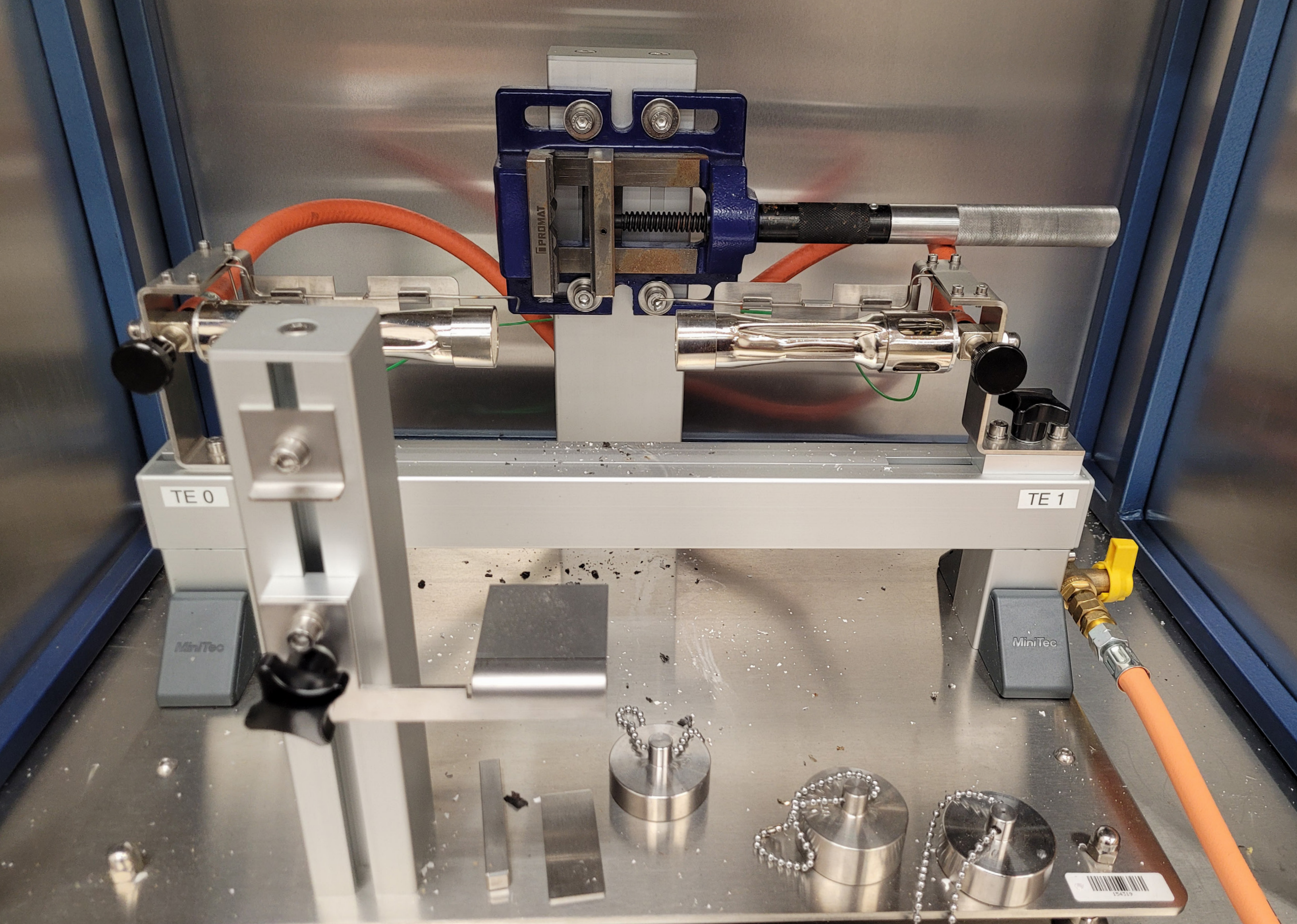
Our proposed scope focuses on procedures using readily available, eco-friendly (biomass based) chemicals, thereby increasing the likelihood of future commercialization. We are exploring further development involving methods to scale up the proposed methodology, making it applicable and effective for various fibrous substrates.

Post fire behaviour of aeronautical multi-layer polymer metal laminates

A multi-layer polymer metal laminate (PML) system can be used to thermally insulate lightweight structural materials, such as aluminium or carbon fibre reinforced plastic (CFRP) composite, when exposed to fire. The system includes many thin adhesively bonded metal foils, bonded directly to the structural substrate. When exposed to fire the PML adhesive thermally decomposes with the generation of volatiles, causing the foils to delaminate and inflate, thus greatly reducing its thermal conductivity.



The influence of fire conditions on the thermo-physical properties of multi-layer polymer metal laminates woven-ply PPS and epoxy will be investigated in this project. More specifically, the key objective of this work is at comparing the changes on laminates meso- and microstructure due to increasing heat fluxes and depending on matrix nature. The residual tensile mechanical properties will be compared considering the specific thermal decomposition of thermosetting- and thermoplastic-based composites, with a particular attention paid to the char formation along with the mass loss.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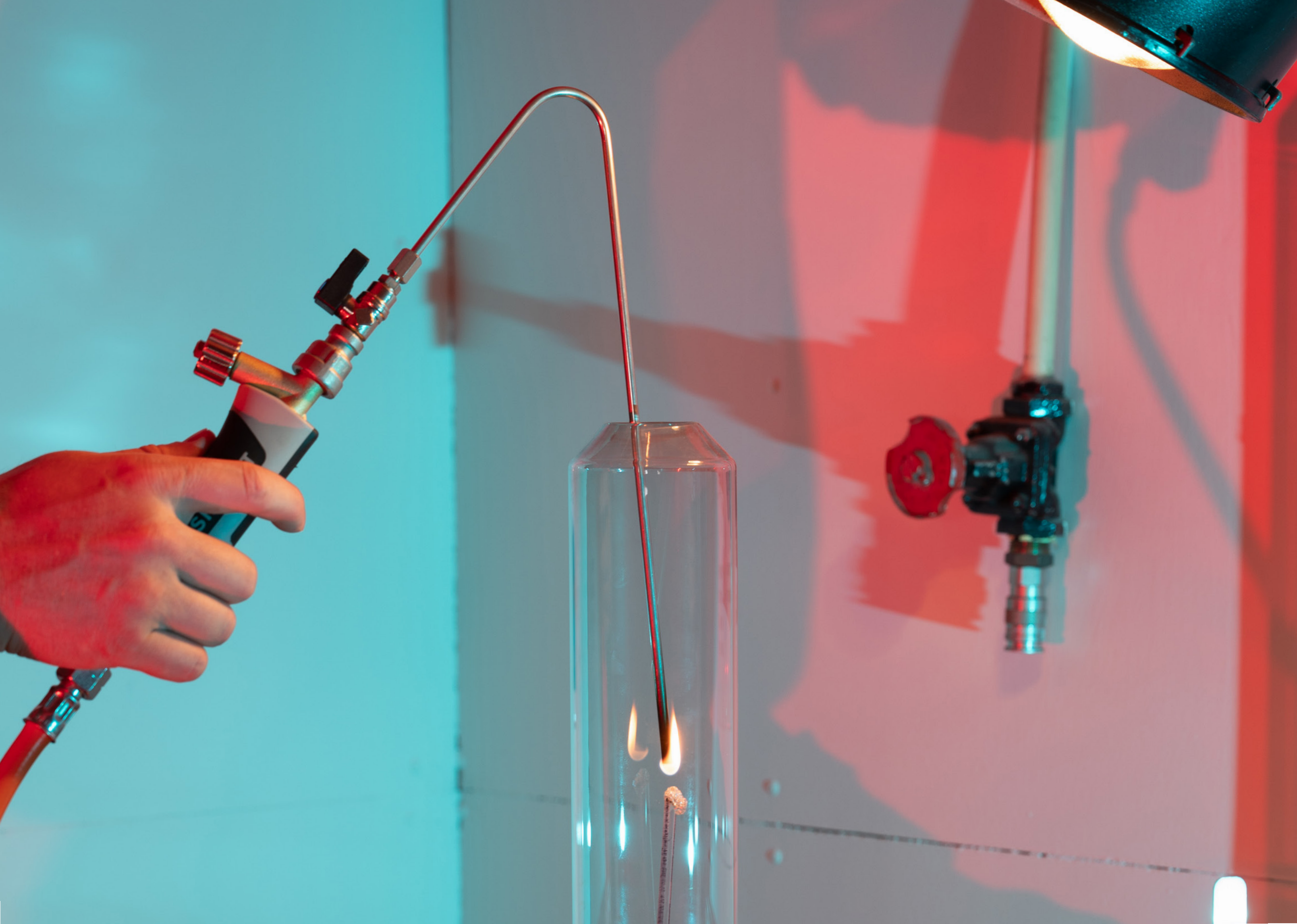
Assessing flame retardancy of fibre-reinforced epoxy resin composites for aerospace and aviation

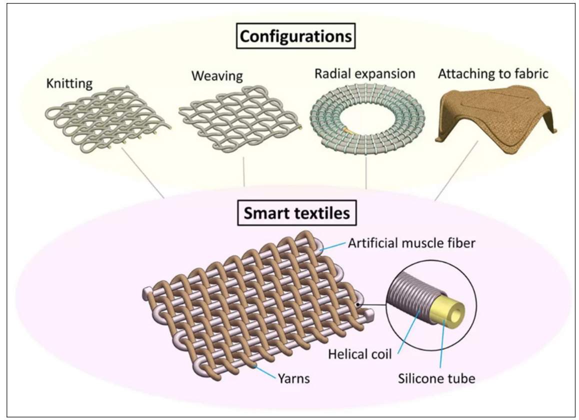
The flame-retardant glass fibre reinforced epoxy composites will be examined for the aviation and defence industry. The fire risks and fire hazards on the environment and human health must be taken into consideration in the case flame-retardant usage when improving their thermal performance.

In this project, the flame-retardant glass fibre reinforced epoxy composites which are produced with low cost environmentally friendly flame retardant (red phosphorus) and smoke suppressants (zinc borate and aluminium three hydrate) instead of high-cost and harmful halogenated flame retardants will be tested. The possible fire risk and hazard of the flame-retardant glass fibre reinforced epoxy composites will be investigated with the laboratory scale fire risk test methods.



Smart Textile for Defence Application

The development of smart textiles can significantly impact various aspects of the lives of defence personnel. New materials that integrate novel technologies enable smart fabrics to retain the necessary wearable and flexible characteristics we expect from our daily clothing. By incorporating these technologies, the fabrics will also see improvements in their mechanical, thermal, and electrical properties.



A major challenge with wearable computing, sensors, actuators, and biomedical garments is ensuring durability, flexibility, and the ability to withstand multiple washing cycles over time. For defence personnel, advancements in textile technologies can enhance battle uniforms, suits, ballistic protection systems, and overall survivability.

Smart fabrics will contribute to the development of lightweight, highly durable materials with exceptional strength. These fabrics will be embedded with antibacterial additives, storage devices, microprocessors, supercapacitors, high-resolution displays, and water purifiers, among other technologies. These advancements will provide significant improvements for army personnel on the battlefield.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