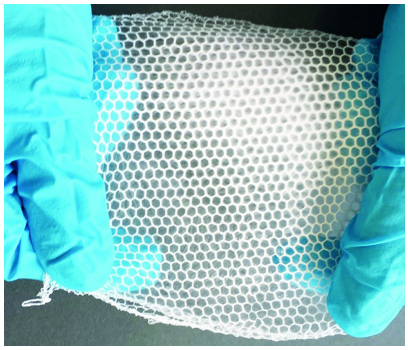
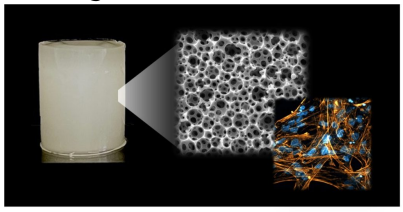
As an integral part of CESAM (Complex and Entangled Systems from Atoms to Materials) research unit and of the department of chemistry of the University of Liège, the CERM develops proven expertise thanks to its academic strength in the design of biodegradable, bio- and CO_2 sourced materials answering the actual challenges of personalized medicine and eco-conception.

As an international team of chemists, CERM is active in fundamental and applied researches focusing on the development of innovative polymers for biomedical and healthcare applications and eco-strategies of polymer synthesis contributing to a safer environment.

It specializes in the synthesis of polymer materials along two main lines: the development of innovative biodegradable materials (ring-opening polymerization, step-growth polymerization) and sustainable polymerization processes. CERM has also created and grows a unique platform ($FRITCO_2T$) in Europe that is dedicated to the transformation/valorization of carbon dioxide into low carbon footprint materials (coatings, adhesives, foams and biomaterials).



Biodegradable membrane for tissue reconstruction - © CERM



Polyphosphoester scaffolds for tissue engineering. © CERM

The CERM enjoys a wide range of research partnerships, at the European level with Universities, Research Centers and SMEs, notably in the frame of INTERREG Mosa-Rhine projects. CERM coordinates the IN FLOW technology platform (flow formulations of biodegradable materials for food, biomedical and healthcare applications) and the running PolyDREAM project that aims to design degradable polymers and greener materials for additive manufacturing supporting the development of the Industry 4.0 in the transborder regions, with a special focus on SMEs active in healthcare and biotechs. Fabot, 3DMaastricht, Iamfluidics, Fibrothelium, Meo., Tenco are

partners of this market-driven research program. The CERM is also very active in material design for advanced medical devices. In this context, it recently participated in the INTERREG PolyValve project aiming to develop innovative polyurethanes for heart valves fabrication by additive manufacturing and in the ERC “PV-Coat” European project on the coating of heart valves that led to the creation of the CMD-Coat spinoff.

The CERM is also involved in MSCA European Join Doctorate networks, such as EJD NIPU and D-Carbonize. The first one deals with the development of new chemistries to prepare non-isocyanate polyurethanes (NIPUs) from carbon dioxide for the production of low carbon footprint and recyclable foams, coatings, adhesives and 3D printing inks. The second one has the ambition to merge the carbon dioxide chemistry with bio-based products for the next generation of greener, circular polymer materials.

The CERM also takes part in the FEDER project UP-PLASTICS for the development of NIPU foams for the construction sector (sound and thermal insulation), and a WEL-T Advanced Grant project financed by the WEL Research Institute for developing new strategies for producing recyclable self-blown NIPU foams from room temperature formulations.

CO2- and bio-based non-isocyanate polyurethane foams. © Jean-Louis Wertz

Design of implants for vaginal, cardiac, dental and ophthalmology applications. © CERM

The CERM can capitalize on important industrial partnerships with Solvay, Solvin, ArcelorMittal, Saint-Gobain, UCB, Dupont, Bayer, and recently Chanel and TESA as well as a great number of SMEs. The CERM expertise in polymers for health has already beneficiated to companies such as Physiol, Mithra, Kiomed-Pharma, Dermax (Hyloris), Wishbone… Incidentally, the CERM initiated startups such as EyeD Pharma based on the development of drug-eluting implants for ocular pathologies.

The CERM patented the various facile, up scalable production modes of recyclable self-blown non-isocyanate polyurethane foams, as well as their related products, with the ultimate objective to bring the technology/products to the market in collaboration with industrial partners.

The CERM currently remains involved in many collaborative research projects related to the implementation of biomaterials which have already passed clinical tests, as well as the development of new processing methods such as electrospinning and 3D printing to design scaffolds stimulating cellular regeneration or various medical implants. Finally, the CERM goes into greater depth on the green technology of supercritical CO2 to design sterile medical devices (suture threads or implants) with anti-inflammatory properties.

Doubtless, the CERM stands well equipped and ready to address the five major challenges which confront it, from developing synthesis techniques to implementing greener processes (organocatalysts, solvent-free processes, chemical reactions based on atom economy), to helping advanced chemistry, developing recyclable polymer materials as foams or multifunctional coatings with aqueous processes or without solvents, or developing competitive biomaterials.

The CERM, with its unique expertise in polymer chemistry, its state-of-the-art equipment for polymer characterization, processing and formulation, and its CO_2 valorization platform, is a partner of choice for boosting the competitiveness of companies active in the healthcare and biomedical sectors, and for supporting companies in the ecological transition. Its CO_2 platform enables to produce kilograms of products needed to realize prototypes to be tested by industrial partners.

Fluorescent non-isocyanate polyurethane foams for sensing applications. © Jean-Louis Wertz

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