Postdoctoral position starting in the autumn of 2026

Center for Materials Forming (CEMEF), MINES Paris - PSL University

Bio-based hydrogels for endovascular embolization

financed by the French National Agency for Research (ANR)

Minimally invasive endovascular embolization is used to treat a wide range of diseases including vascular disorders and osteoarthritis. Current occlusion approaches include liquid embolics, metallic coils, and microsphere suspensions, but they can exhibit significant drawbacks including leakage, toxicity and limited stability over time. In addition, these classical techniques may not allow for additional functionalities such as sustained drug delivery or *in vivo* visualization. In this regard, *in situ* forming hydrogels (water-swollen polymer networks) are a promising option for the embolization of blood vessels. Their initial flowing nature facilitates proper shape adaptation as well as a good fit with the blood vessel wall, and drug molecules can be incorporated homogeneously in the hydrogel by mixing with the precursor solutions. However, the development of hydrogel-based embolic systems remains challenging because of the multiple essential requirements such as rapid gelation and high mechanical stability.

The objective of the postdoctoral project is to develop a hydrogel for the occlusion of blood vessels which can be introduced via a catheter. Natural, renewable polymers will be used as the building blocks and relevant properties of the biomaterial (e.g. gelation time, mechanical stability, long-term degradation) will be optimized by adjusting the preparation conditions. The potential of the hydrogels as drug-releasing embolic agents will be evaluated using *in vitro* and *ex vivo* models.

This interdisciplinary and challenging project is funded through the ANR project INHALE. The postdoctoral researcher will be based at CEMEF, a joint research center of MINES Paris - PSL and CNRS, located in Sophia Antipolis, France. The work will be carried out in close interaction with clinicians from Nice University Hospital, whose expertise will help ensure the clinical relevance of the developments and guide the definition of meaningful physiological and medical scenarios. The project will also benefit from strong collaborations with partner laboratories bringing complementary expertise in biomedical characterization, such as TUHH in Hamburg and SAINBIOSE in Saint-Étienne. This research environment offers a rare opportunity to work at the crossroads of biomaterials engineering, polymer chemistry, biomedical research, and endovascular medicine within a highly interdisciplinary and medically driven project.

CEMEF is a leading research institute in France, with activities spanning a broad range of topics in materials (including polymer-based and bio-inspired materials), mechanics, biochemistry, and industrial transformation processes. It develops cutting-edge research combining experimental approaches with state-of-the-art numerical simulation and artificial intelligence methods. CEMEF coordinates several national and European projects (ERC, PEPR, ANR) exploring the coupling of these methodological approaches for the modeling and control of complex biomedical systems,

with applications in the development of decision-support tools for the personalized treatment of vascular and respiratory diseases. CEMEF is deeply committed to collaborative, goal-oriented research, closely connected with both academic and industrial partners. It also trains high-level professionals and academics through dedicated programs in core areas related to materials science, mechanics, computer engineering, and artificial intelligence. CEMEF offers outstanding students and young researchers the opportunity to pursue their training in a high-quality research environment while developing their professional network and engaging with the world of science in dynamic and stimulating ways.

Keywords: Polymers, hydrogels, physico-chemical properties, biomaterials, drug delivery, embolization
Profile: Expertise in materials science, polymers as well as biomedical applications; fluent in English; highly motivated; pro-active; PhD thesis completed
Duration: 12 months, starting in autumn 2026
Location: CEMEF (research center of MINES Paris located in Sophia Antipolis, France)
People involved: Dr. Sijtze Buwalda, Dr. Philippe Meliga, Prof. Elie Hachem

Please send your detailed CV, motivation letter, grades of your Bachelor and Master and at least two e-mail addresses of reference persons to sijtze.buwalda@minesparis.psl.eu **before July 15th, 2026.**