PhD position starting in early 2021

MINES ParisTech, Center for Materials Forming (CEMEF)
Sophia Antipolis, France

3D printing of hyaluronic acid aerogels as on-demand removable wound dressings (3D-AER-HYAL)

financed by the French National Agency for Research (ANR)

Wound management is nowadays a major health issue. Wound-related health problems will be accentuated in the years to come because of the aging of the population whereby the prevalence of wounds, in particular chronic wounds, will increase. Wound dressings are the most important tool for wound management; they can have various forms ranging from foams to hydrocolloids and hydrogels. Very recently, it has been demonstrated that certain polysaccharide solutions can be used to 'print' hydrogels in complex forms, which is particularly useful for wound dressings that often require unique shapes.
The objective of the 3D-AER-HYAL project is the preparation of on-demand removable, hyaluronic acid-based aerogels obtained by additive manufacturing for application as wound dressings which are capable of releasing biologically active agents. Bio-aerogels are highly porous, nanostructured materials with a large internal surface area; they are obtained via non-toxic processes from solutions and hydrogels of polysaccharides. The project is at the interface of materials science (biobased polymers, aerogels, 3D printing), chemistry (polymer crosslinking) and biomedical applications (wound dressings, controlled release). Hyaluronic acid will be printed into hydrogels using a support bath, which avoids the disadvantages of conventional printing-in-air, including clogging of the printing nozzle and gravity-induced structural collapse during printing. Relevant drugs (e.g. antibiotics) will be incorporated in the aerogels physically via mixing and impregnation. The potential of the bio-aerogels as drug-releasing wound dressings will be evaluated using *in vitro* and *ex vivo* models.

This highly interdisciplinary project will be carried out in two laboratories: (1) the majority of the work will be performed in the Center for Materials Forming (CEMEF), which has significant expertise in the processing and forming of polymers, in particular bio-aerogels, and (2) secondments will take place in the Institute of Biomolecules Max Mousseron (IBMM, Montpellier), which has extensive experience in the domain of medical devices and controlled release systems.
The thesis will be performed in the framework of the ANR JCJC project '3D-AER-HYAL' (Young Researcher scheme of the French National Research Agency). The position is open from early 2021 for three years.

Keywords: Polymers, gels, physico-chemical properties, mechanical and processing properties, encapsulation and release, 3D printing, biomaterials, wound dressings
Profile: Knowledge in materials science, polymer chemistry and physics; fluent in English, highly motivated, pro-active; MSc thesis completed
Duration: 3 years, starting in early 2021
Gross annual salary: ± 26 k€
Locations: CEMEF (Sophia Antipolis), IBMM (Montpellier)
People involved and group info: Dr. Sijtze Buwalda & Dr. Tatiana Budtova, Biobased Polymers and Composites group (CEMEF); Prof. Dr. Benjamin Nottelet, Polymers for Health and Biomaterials (IBMM)
Contact: Dr. Sijtze Buwalda, sijtze.buwalda@mines-paristech.fr

Please send your detailed CV, motivation letter, marks of your Bachelor and Master and at least two e-mail addresses of reference persons.