

# ITI HiFunMat Master Internship Proposal

M 1

M 2

**Title: Biocompatible, in situ injectable, and curable foam for negative pressure therapy**

## Internship supervisor

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Laboratory	Institut Charles Sadron
Collaboration with a HiFunMat member ( <i>please indicate their name</i> )	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes :

## Student profile looked for

Master program ( <i>more than one box can be ticked</i> )	<input checked="" type="checkbox"/> Material science and engineering <input checked="" type="checkbox"/> Chemistry <input type="checkbox"/> Physics
Other indications if necessary	

## Internship description

**Context:** The aims of wound healing by negative pressure therapy (TPN) systems are (i) to stimulate the mechanism that promote wound healing, (ii) to contract the wound edge, (iii) to improve local blood circulation, (iv) to stimulate the cell migration and proliferation, (v) to eliminate the exudates, (vi) to reduce the bacterial load. They are used for surgical wounds at high risk of complications, the non-saturable traumatic wounds, the wounds with extensive and/or deep loss of substance, with or without infection, and chronic wounds that do not heal in the first instance.

The limitations of the technique are the long process to apply the preformed foam that has to be cut to fit each wound, leading its administration can only be done by authorized nursing staff, which limits its use. This kind of foam have to be changed every 2 to 4 days (therapy lasts about 2 weeks), for the irregular wounds, the gauze is preferred and finally, the open-pores of the foam adheres to the wound tissue, causing pain to the patient and damage to the granulation tissue when changing foam is needed.<sup>1</sup>

**Goal of the project:** Development of an injectable liquid foam form, in situ curable in deep wound for negative pressure therapy (TPN).

**Methodology:** prepolymer of the PU foams will be synthesized and the formulation of the foam will be optimized for the application.<sup>2</sup> The resulting foam will be characterized by rheology, microscopies (Numerical, Confocal, and SEM), tomograph, SAXS and WAXS. The foam will then be tested in mocked conditions with a TPN system.

### References:

- (1) Lainé, P., La pression négative topique, *ACOPHRA*, Lyon, 2008; Lazaro, M. et Carre, E., La thérapie par pression négative, *ACOPHRA*, Lyon, 2018; Traitement des plaies par pression négative: des utilisations spécifiques et limitées, Haute autorité de santé, 2011.
- (2) Bonzani, I. C., *et al.*, *Biomaterials* 2007, 28, 423; médicaments.gouv.fr, (Ed.: santé, M. d. s. e. d. l.), base de données publique des médicaments, 2024; P. Bruin, J. Set al., *Biomaterials* 1990, 11, 291.