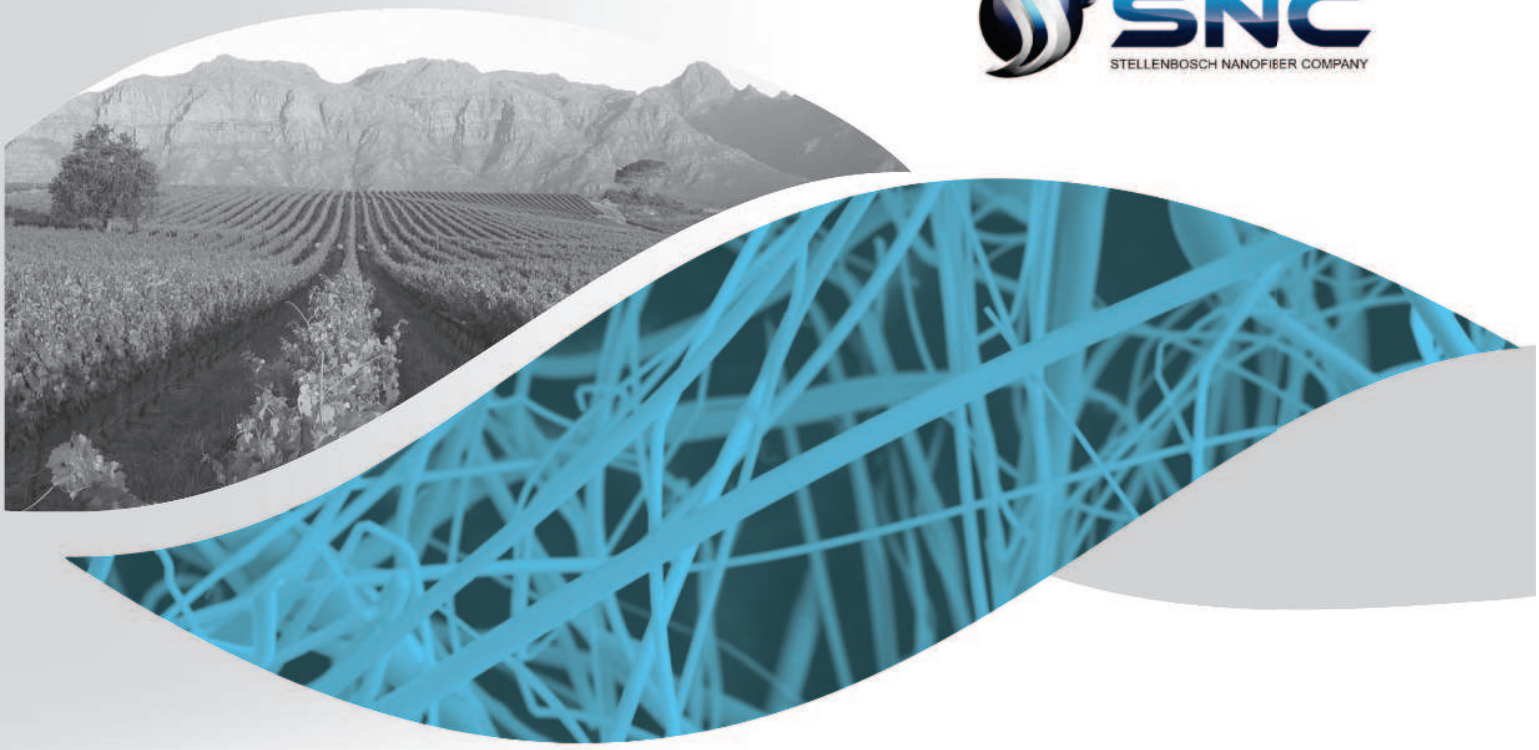

ELECTROSPIN2018
INTERNATIONAL CONFERENCE

16th to 18th January 2018

Wallenberg Research Centre at Stias

Stellenbosch, South Africa

Hosted by The Stellenbosch Nanofiber Company

ELECTROSPUN POLYACRYLAMIDE HYDROGEL NANOFIBERS: FROM NANOCARRIERS TO STIMULI RESPONSIVE NANOMATERIALS

S. Pawlowska, P. Nakielski and F. Pierini

Institute of Fundamental Technological Research, Polish Academy of Sciences, Warsaw, Poland.

Tissue engineering and drug delivery strategies have great potential for medical treatments of several diseases and injuries. Their applicability is limited by the lack of implanted materials adaptability to the specific biological tissue requirements over time. Smart hydrogels appear to be promising materials for the development of a new generation of biomaterials [1].
The present study is based on the idea that smart electrospun polymer hydrogel materials based on polyacrylamide and liquid crystals allow tuning of the material rigidity and drug delivery properties as required. The material changes could be triggered by external stimuli which interact with the incorporated stimuli responsive molecules inducing localized stresses inside the polymer networks. The required hosting materials can be developed using coaxial electrospinning and an appropriate post-electrospinning treatment [2].
Herein, we describe a novel method based on electrospinning for obtaining soft hydrogel nanofibers able to accommodate liquid crystals and release dedicated molecules. Two different types of hydrogels with several polymer/cross-linker ratios were produced and deeply studied. Nanofibers chemical, morphological (Figure 1), structural and mechanical properties as well as their ability to carry and release drugs were characterized.

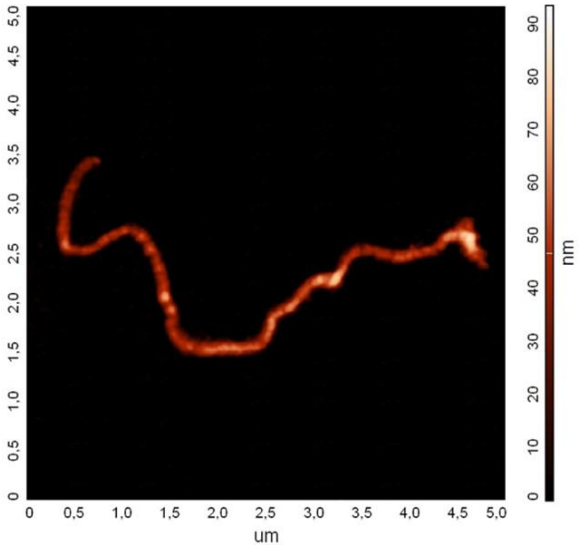

Figure 1: AFM topography of a single electrospun hydrogel nanofilament [2].

Moreover, based on the fact that the developed elongated, soft and flexible nanomaterials can easily travel in crowed environments of body fluids and biological tissues, particular attention was paid to the study of their dynamics and rheology in flow. Nanofilaments were placed in a microchannel and their motion was then analysed studying bending dynamic and migration under the influence of a pulsatile laminar flow, which is designed to simulate body fluid flow. The results highlight the key role of morphology and stiffness on mobility of nanofilaments and their applicability as drug nanocarriers and stimuli-responsive materials.

Project supported by the National Science Centre (NCN) grant no. 2015/19/D/ST8/03196.

References

[1] U. Freudenberg et al., *Advanced Materials*, **2016**, 28, 8816.
[2] P. Nakielski, S. Pawlowska, F. Pierini et al. *PLoS One*, **2015**, 10, 0129816−0129832.