Supramolecular hydrogels from short glycosylated peptide amphiphiles

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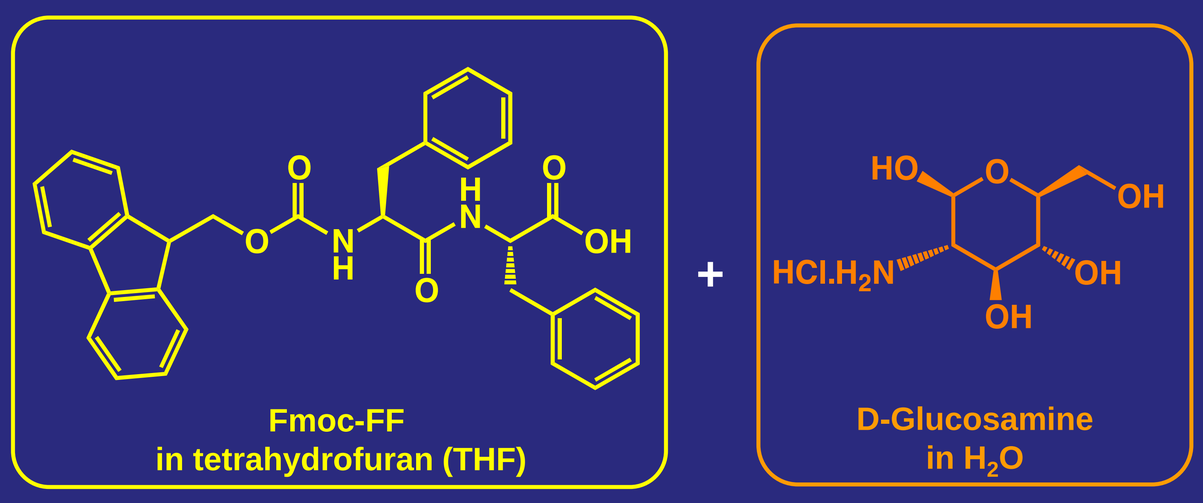
INTRODUCTION

The ability of nanotechnology to shape the materials at the nanoscale is gaining growing interest due to its repercussion in the properties of the materials and their interaction with the surrounding environment. Template-free supramolecular nanoassembly is a bottom-up approach that allows fabrication of new biomaterials (e.g. nanotubes, nanospheres, nanofibrils) with defined morphologies that can be used in wide variety of applications, going from nanostructures for the controlled growth of cell populations and for cell therapies to more sophisticated assemblies that can be used in vivo to promote regenerative processes. The use of materials that can undergo self-assembly in conditions that are cell-compatible and can be injected into the body in a minimally invasive way is very appealing.[1]

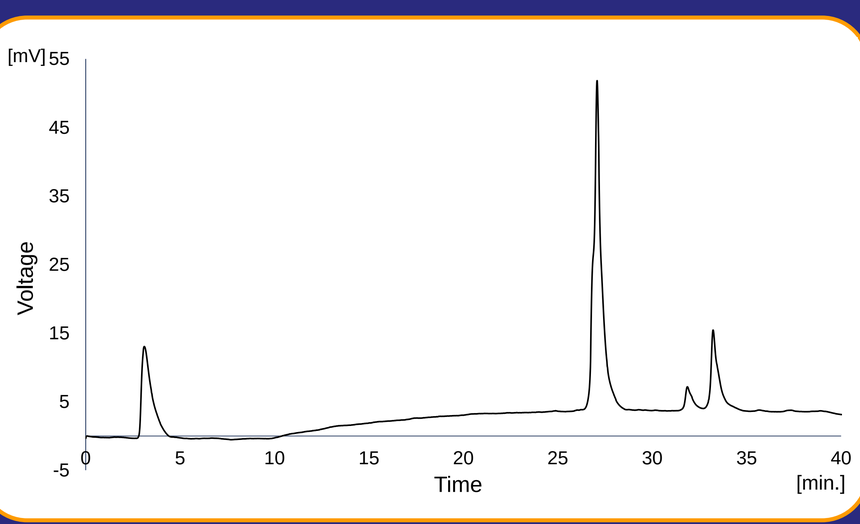
So far, mainly extracellular matrix (ECM) proteins and/or their small peptide epitopes that copycat specific sequences have been explored in the development of supramolecular hydrogels able to host cells and protect proteins.[2,3] Nevertheless, the ECM contains another class of biomolecules – glycans – that do also play important roles in tissue structuring and function. In fact, glycosylation is the most important post-translational modification of proteins that can alter their stability and activity. Here, we propose to use short glycosylated peptide amphiphiles for the assembly of supramolecular gels. The amphiphiles are obtained from the respective peptide analogue (e.g. N-fluorenylmethoxycarbonyl diphenylalanine, Fmoc-FF) and a monosaccharide (e.g. glucose, galactose) through 1-Ethyl-3-(3-dimethylaminopropyl)carbodiimide/N-hydroxysuccinimide (EDC/NHS) coupling.

MATERIALS AND METHODS



CHARACTERIZATION

High Performance Liquid Chromatography (HPLC)

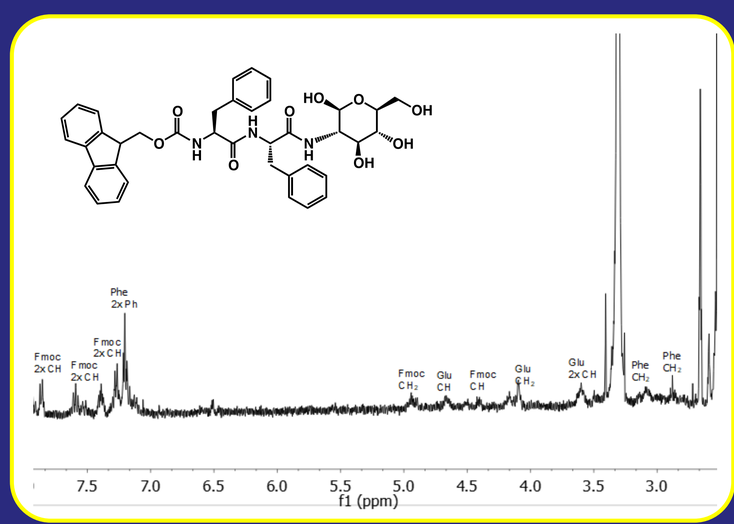


The main peak was separated and analysed by ^{1}H NMR and ESI-MS to identify the compound.

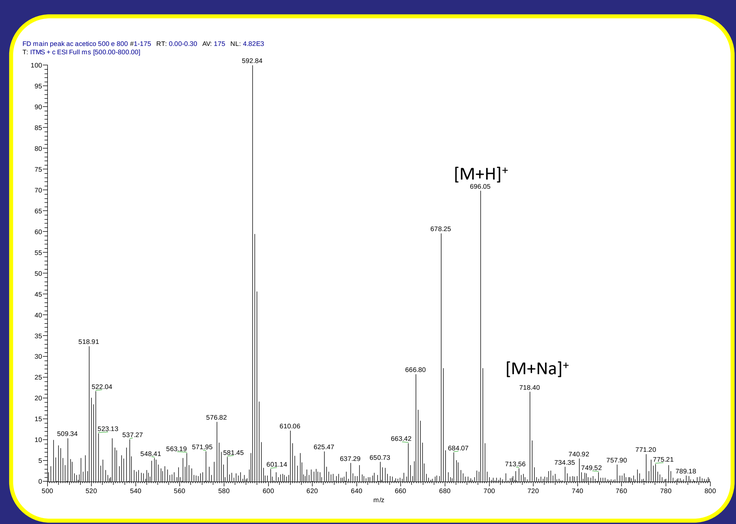
Gradient: 20% to 80% of (0.1%TFA) ACN

Identification

Nuclear Magnetic Ressonance (^{1}H NMR)



Electrospray Ionization Mass Spectrometry (ESI-MS)



Molecule name	Molecule identification by ESI-MS	
	Expected mass (g/mol)	Observed mass (g/mol)
Fmoc-FF-glucosamine	696.76 $[M+H]^+$	696.05 $[M+H]^+$

CONCLUSIONS AND FUTURE WORKS

The glycopeptide was successfully synthesized and purification is on going work. Different saccharide units will be used to investigate their influence on assembly process of the gels. Cell encapsulation and targeted delivery will be further explored.

References:

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2. Zhou, M. *et al. Biomaterials* **30,** 2523–2530 (2009).
3. Yang, Z. *et al. Chem. Commun.* 843–845 (2007). doi:10.1039/B616563J

Acknowledgments:

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