



## Nailing And Fishing – Secrets of Surface Functionalization

Samuele Tosatti is CEO and co-founder of SuSoS AG, a Swiss company specializing in surface modification and characterization. As one of the industrial partners involved in the ASMENA project, SuSoS AG supplies solutions for polymer functionalization of nanopores which are essential components for the analytical profiling and drug screening capabilities of the device that are being developed.

An important task in the ASMENA project has been to find ways to correctly position liposomes over nano pores. Samuele explains,

–In this case, the surface material used for the substrate, silica, is not the simplest one to work with. You need to find a way to bind polymers including biofunctional groups to the surface. To prevent non-specific binding, this binding needs to be stable. Our task in the ASMENA project was to provide a surface modification technology that would act as an interface between the silica surface and the proteoliposomes on top of this.

### ”Nailing” Polymers To The Surface

Since one aim of the ASMENA project is developing methods and technologies that will make analytical profiling and drug screening cheaper (while increasing accuracy and information content), SuSoS AG developed a method that was used to bind polymers to the chip surface.

– Different methods can be used to do this. For example, one expensive method involves building a rather complicated polymer architecture on the surface. You can compare this method to those small wooden toy trains that are attached to each other with magnets. You cannot attach them just any way – you need put them together so that the magnets attract each other. This method was actually used to begin with in the ASMENA project.



Samuele Tosatti is CEO and co-founder of SuSoS AG, one of the industrial partners in the ASMENA project. His company supplies surface functionalization solutions.

Our method, on the other hand, is very simple and also much cheaper. It works a bit like a nail: I choose my functional group, attach the polymer I want, and then nail it to the surface using UV light. To use the analogy with the wooden toy trains – I don’t need to worry about the magnets being turned the right way, I just need something with four wheels, and then I nail the pieces together precisely where I want them, Samuele explains.

Once the polymers and the functional groups have been ”nailed” to the surface through the use of UV light, any superfluous polymers can simply be rinsed away, without compromising

the quality of the interface or the functional groups. The surface will be non-fouling, i.e., biological molecules will not bind to the surface unless they fit to the functional group.

### **Fishing For Liposomes**

In order to achieve efficient lab-on-a-chip solutions for analytical profiling and drug screening, it is important to be able to measure the function of different membrane proteins on different areas of the chip. Thus, you need to be able to guide the liposomes containing the various membrane proteins to be tested into precisely the position on the chip where you want them to be. SuSoS AG developed solutions for this as well. Samuele explains,

– You can liken it to when you go fishing. For some types of fishing, you need a longer line, and you may also need a very specific type of bait. In this case, our fishing lines, the polymer chains, needed to be long enough and contain just the right bait or functional groups to catch just the right proteoliposome over each nano pore.

The result is a technology for sorting membrane samples on lab-on-a-chip devices, specifically developed for the needs of the ASMENA project.

### **Benefits of ASMENA Participation**

Samuele sees several benefits of having his company participate in projects like ASMENA.

– For us, the main benefit of participating in a project like this is that it facilitates closer interaction with other companies. For example, we now work more closely with Farfield and Microvacuum. They need coatings for the chips used in their instruments, and we can provide them with that. The cooperation means that we are able to get a much better picture of what these companies need, and are thus able to provide them with products optimally suited for their instrumentation. That adds value to their products as well as for the end users of the products.

– We are always looking for projects like this one to participate in, and I hope we will be able to take part in future EU projects as well. I have to say though, that this project has been unusually well put together. The project was built around an important problem, and then the various partners were asked to participate based on the fact that they had expertise and products needed to solve this problem. In my opinion, that is how it needs to be done if you truly want to reach results.

*ASMENA is part of the EU Seventh Research Framework Programme (FP7). Over three years, the consortium consisting of 15 partners in 7 countries aims to develop new platforms for drug screening and analytical profiling based on in vitro measurements of functional and conformational changes in membrane proteins. Such tools will allow standard profiling and screening of membrane protein targets that can currently not be screened in these ways. They will shorten the time and cost involved in drug lead development by increasing predictability as well as as contribute to fundamental understanding of structure-function relationships of membrane proteins.*

*The partners of the consortium are world leading experts on surface functionalization, membrane self-assembly, biosensing, membrane protein functional measurements and commercialization of the same. Now, their complementary competences can be put together on the European level to create a timely breakthrough in the area.*