Functional packaging with less material

March 9 2016, by Mats Tiborn

Much of the food sold in our grocery stores are packaged to avoid that substances like oxygen get in contact with the food and decompose it. It is of great importance to know which parameters that decide the permeability of the material. Within the competence center SuMo BIOMATERIALS at Chalmers researchers are developing materials with optimized properties.

Sofie Gårdebjer, PhD at SuMo and Chemistry and Chemical Engineering recently defended her thesis "Mass Transport Through

Polymer Films: The Importance of Interfaces and Compatibility" where she demonstrates techniques to create functional barriers, while at the same time reducing material usage, which is desirable since packaging contributes to a significant amount of our waste.

Can you describe the material that you examined?

A composite materials may consist of a matrix polymer and a filler. When these are combined it is desired that the filler is dispersed as much as possible, especially if you have a dense filler with the purpose of reducing the permeability. The better the filler is dispersed into the matrix the harder for the molecules to get through the barrier. Another way of combining materials is by creating laminates, i.e. layer structures. Also in this case it is important to have a good compatibility between the materials to get a good barrier.

Tell us about your results.

It is not a simple task to create a good barrier. There are many factors that are important when creating a barrier material. Our results show, for example, that when the filler is well dispersed in a composite material, it can results in a porous material. Porous materials have lower barrier properties than a non-porous. We also show that we can improve the barrier properties of the laminates when the polymer chains are in order at the interface, which acts as a barrier for transported molecules.

How interested is the industry of your research?

Since I'm in SuMo Biomaterials I get my research questions directly from the industry. There is also a general interest in creating as good barriers as possible from as little material as possible. Another thing is that you may not always want a totally impermable barrier. For example,

in a wound care product you don't want to have any accumulation of water on the skin, but you want to adsorb wound exudate. Also in this case it is important to know the structure of the material and its barrier properties.

Has it been beneficial for you to be part of SuMo BIOMATERIALS?

I think it has been very valuable to be part of Sumo. It is motivating to know that what I do is of interest to someone else too. It is also inspiring to see so many dedicated people who are interested in what I do. I have had good relationships with several of the companies involved, which I have learned a lot from. Another positive thing is that we get a lot of training in communication, since we must be able to explain what it is we do in an understandable way for people who are not so familiar with the topic but still are interested.

Anette Larsson, you have been Sofie's supervisor during her time as a PhD student as well as being direktor of SuMo BIOMATERIALS. How does her thesis connect to SuMo's mission?

This project is close to the focus question of SuMo, molecular transport in materials and how it is dependent on the structure of the materials. It has contributed to SuMo by giving new insights in how the properties of the interfaces in a material influence the molecular transport. The knowledge platform can inspire Swedish companies to develop more efficient package materials. At the same time one should remember as stated by Lawrence Nielsen, 1967: "Permeability, especially of liquids, is extremely complex, and many different types of behavior can be expected." Therefore, SuMo will continue to develop knowledge within

this area.

More information: Sofie Gårdebjer's doctoral thesis: publications.lib.chalmers.se/p … es-and-compatibility

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