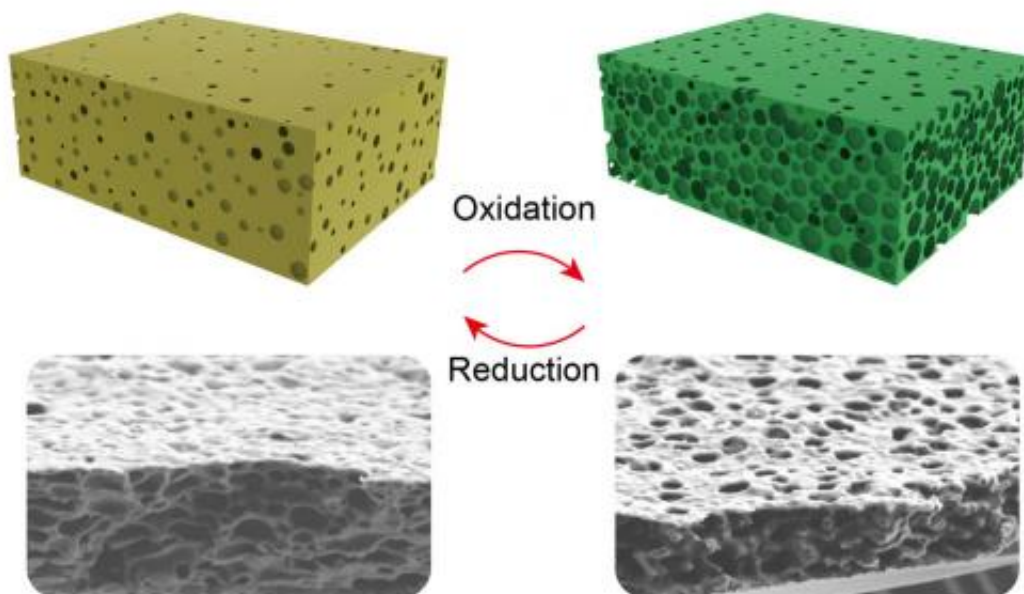


# 'Swiss cheese' membrane with adjustable holes

October 31 2014

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Changing membrane pore size by oxidation and reduction

A new membrane, developed by University of Twente scientists, can be made more or less porous 'on demand'. In this way, smart switching between 'open' and 'closed' is possible, which opens the way to innovative applications in biosensors, chemical analysis and catalysis. The researchers of the MESA+ Institute for Nanotechnology present their results in *Angewandte Chemie*. Their paper is designated 'very important' by the journal.

The [pore size](#) of the smart membranes can be adjusted from the outside: this is very attractive in applications like biosensors or chemical analysis. The 'Swiss cheese' structure is characteristic of many [polymer membranes](#) and is now modified by introducing iron within the polymer. Using an electric signal or a chemical reaction, the pore size can be adjusted. The key to this is controlled adding or extracting of electrons to and from iron.

## **Cheap biosensor**

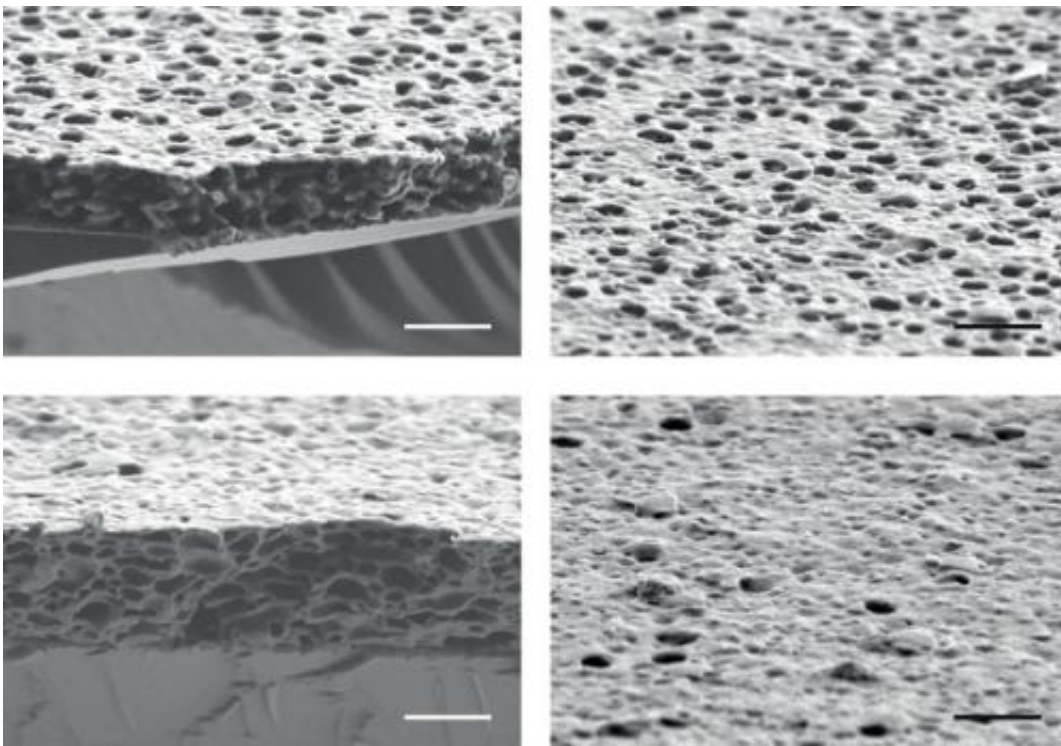
Thanks to this adjustable pore size, the permeability and selectivity of the membrane can be tuned, for separation purposes or controlled release. The UT scientists see possibilities in analysis and separation of proteins, for example. An extra

advantage of the new membranes is the change in colour that takes place. The process of protein detection and analysis becomes visible in an easy way, which may lead to a cheap type of biosensor.

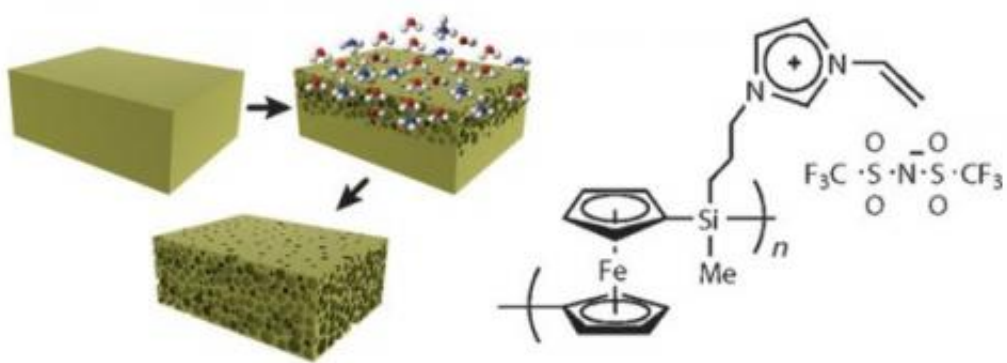
## **Silver nanoparticles**

Another application of the smart membrane is in catalysis. Here, it is possible to kill two birds with one stone. Whilst the pore size and permeability can be altered using a chemical reaction with silver salt, nanosize particles of silver are deposited on the membrane at the same time. Silver is an important catalyst in many applications.

The [membrane](#) research is conducted by the Materials Science and Technology of Polymers group, led by Prof. Julius Vancso. This group is part of the MESA+ Institute for Nanotechnology of the University of Twente.



Adjustable membranes



**More information:** Kaihuan Zhang, Xueling Feng, Dr. Xiaofeng Sui, Dr. Mark A. Hempenius and Prof. G. Julius Vancso, "Breathing Pores on Command: Redox-Responsive Spongy Membranes from Poly(ferrocenylsilane)s," *Angewandte Chemie International Edition*, [DOI: 10.1002/anie.201408010](https://doi.org/10.1002/anie.201408010)

Provided by University of Twente

Citation: 'Swiss cheese' membrane with adjustable holes (2014, October 31) retrieved 24 April 2024 from <https://phys.org/news/2014-10-swiss-cheese-membrane-adjustable-holes.html>

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