

Duncan den Boer, 17 juni, 2008

Scanning Tunneling Microscopie van katalytische moleculen in vloeistof

Martijn de Wild
Koen Timmers
Michiel Coenen
Onno van den Boomen
Hans Elemans
Jan Gerritsen
Theo Peters
Alan Rowan
Roeland Nolte
Sylvia Speller



Radboud University Nijmegen



Katalyse

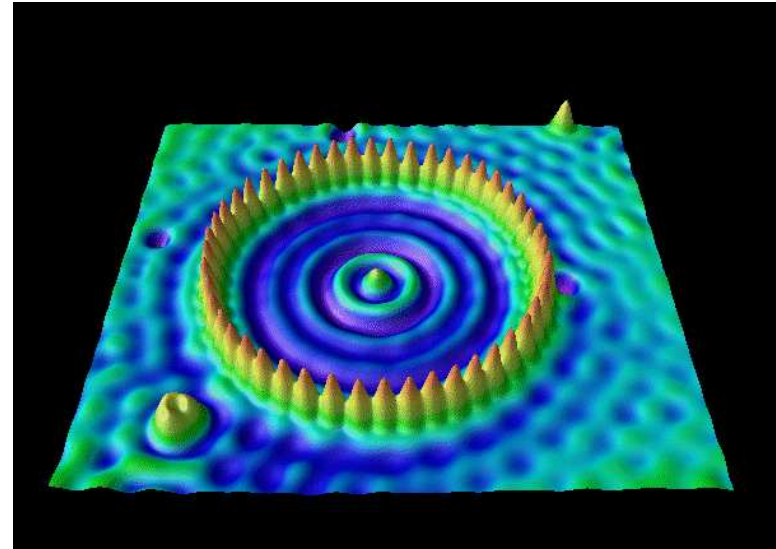
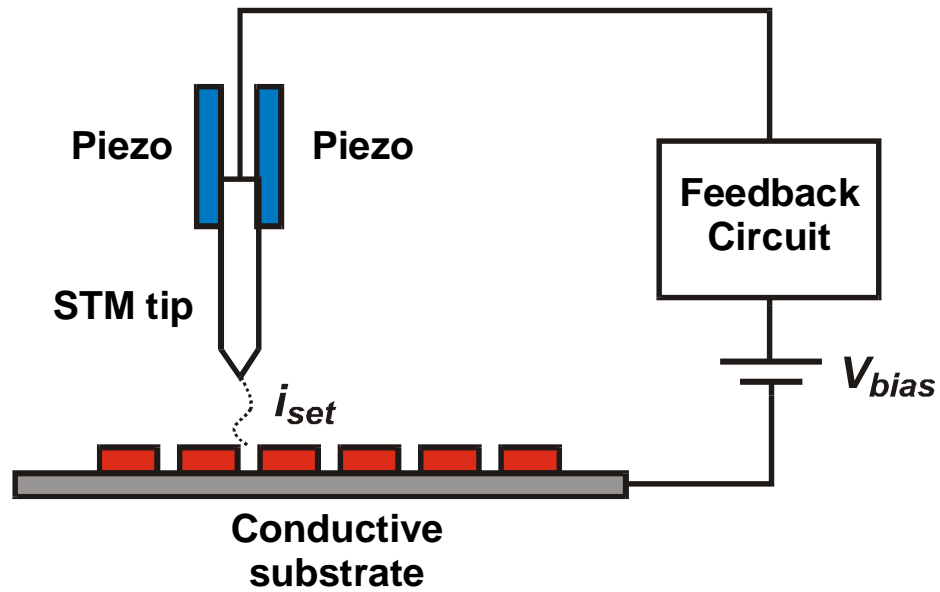
- Een katalysator is een stof die de snelheid van een bepaalde reactie beïnvloedt zonder zelf verbruikt te worden
- Overal in de industrie te vinden

- Computerchips
- Medicijnen
- Brandstof
- Plastic
- ...

**Minder afval,
minder energie nodig,
minder materiaal**



Scanning Tunneling Microscopie



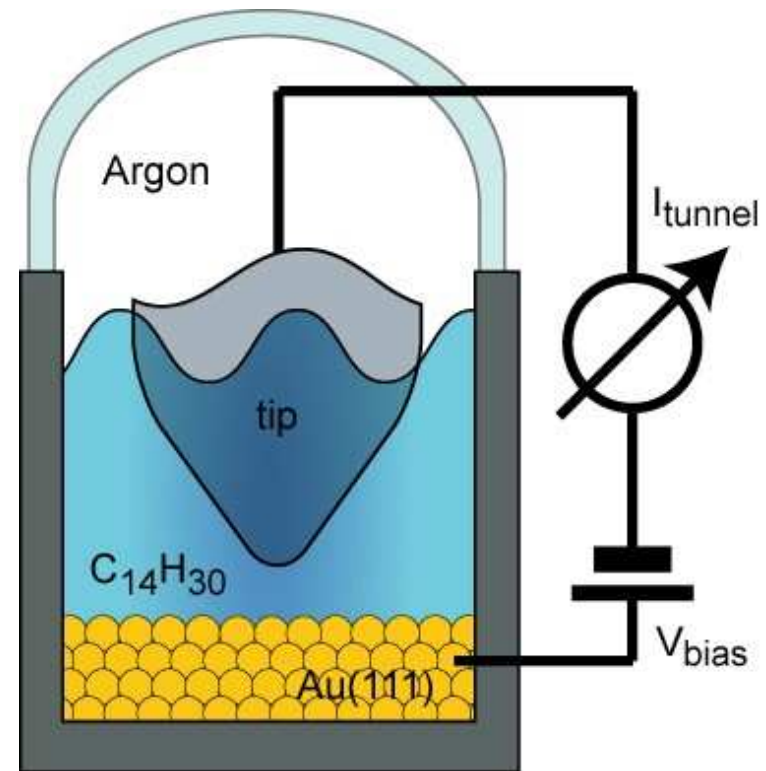


Scanning Tunneling Microscopie in vloeistof

- Chemische reacties: in vaten
- Biologische processen: in cellen

=> interessante dingen
gebeuren in vloeistof

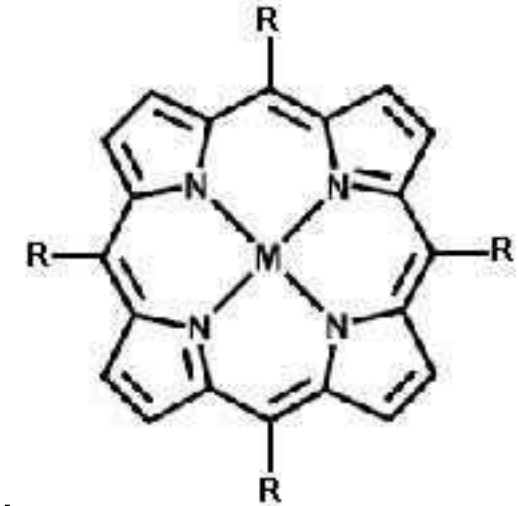
- “The liquid-solid interface is, in our opinion, the interface of the future.”
Heinrich Rohrer, Gerd Binnig
Nobel Laureates
Uitvinders van de STM



Porferines

- Belangrijk systeem: fotosynthese, zuurstof transporteren
- Veelzijdige moleculen
- Platte moleculen
- Nobel Prize Scheikunde 1929, Hans Fischer

“Synthese van porferines; structuur van hemin”



Heme



Hemoglobin



Erythrocyte

Google Image resultaat voor http://www.phthalocyanine.com/images/phthalocyanine_010_chlorophyll.jpg - Windows Internet Explorer

Bestand Verwijlen Druk Favorieten Extra Help [LinkMe! Instellingen](#)

Google [De link de afbeelding op een grootte](#) [www.phthalocyanine.com/images/phthalocyanine_010_chlorophyll.jpg](#) 220 x 220 - 51 kB [Afbeelding kan verboden worden weergegeven en auteursrechtelijk beschermd zijn.](#) [Een vergelijking](#) [Statistiek in Afbeeldingen](#)

Heronder vind je de afbeelding in zijn oorspronkelijke context op de pagina www.phthalocyanine.com/stock_images_013.htm

Image showing the principle behind GFP fluorescence. The protein absorbs blue light and re-emits it as green light. The protein is used extensively in life science research.

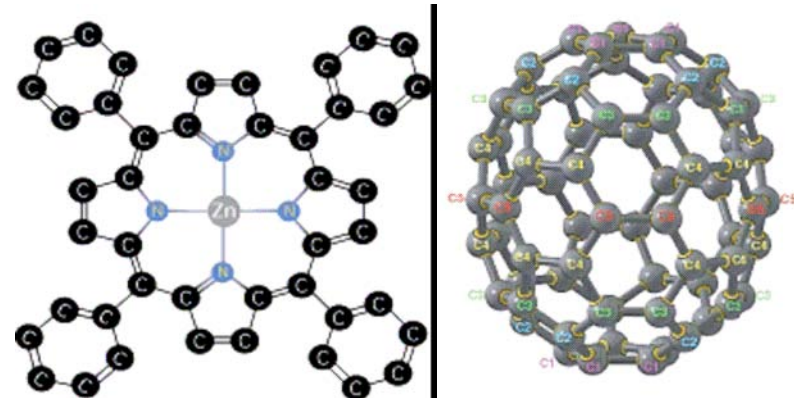
Image showing the principle behind chlorophyll's role in photosynthesis. The protein absorbs blue light and re-emits it as green light. The energy of light that is absorbed by this molecule is ultimately used to generate chemical energy to drive metabolic processes.

Green Fluorescent Protein v2 Green Fluorescent Protein v2 Chlorophyll



Porferine: mogelijke applicaties

- Zonnecel [1]
(bijv samen met buckybal)
- Moleculaire electronica
- Tumordetectie[2]/
Tumorbestrijding[3]



[1] www.elettra.trieste.it/science/highlights/2003-2004/elettra-hl0304-r15.pdf -

[2] Int J Radiat Oncol Biol Phys. 2005 Oct 1;63(2):545-52

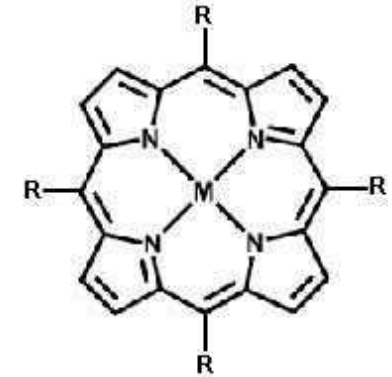
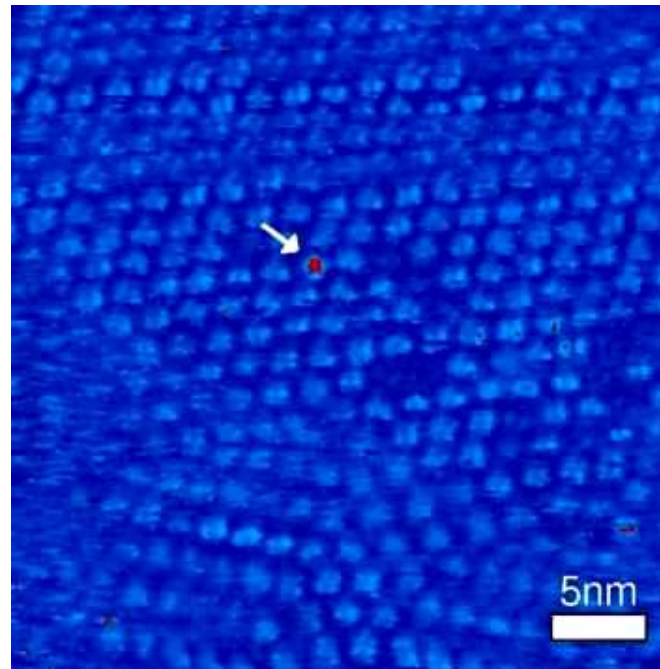
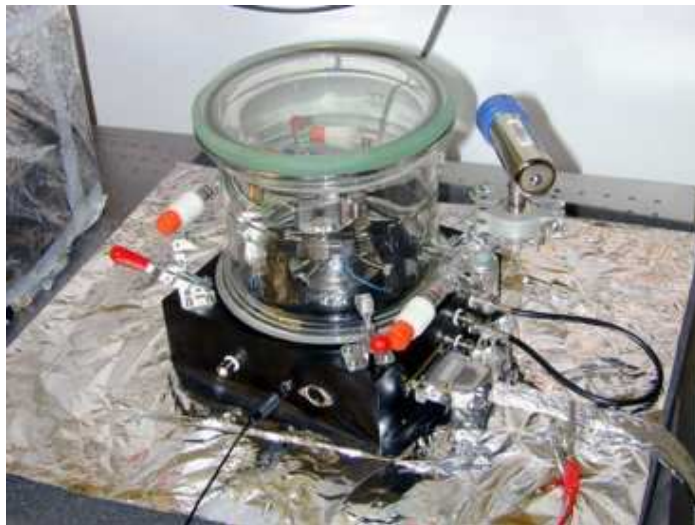
A manganese porphyrin superoxide dismutase mimetic enhances tumor radioresponsiveness.

[3] <http://www.freepatentsonline.com/EP0144409.html>

Localization of cancerous tissue by monitoring infrared fluorescence emitted by intravenously injected porphyrin in tumor-specific markers excited by long wavelength light



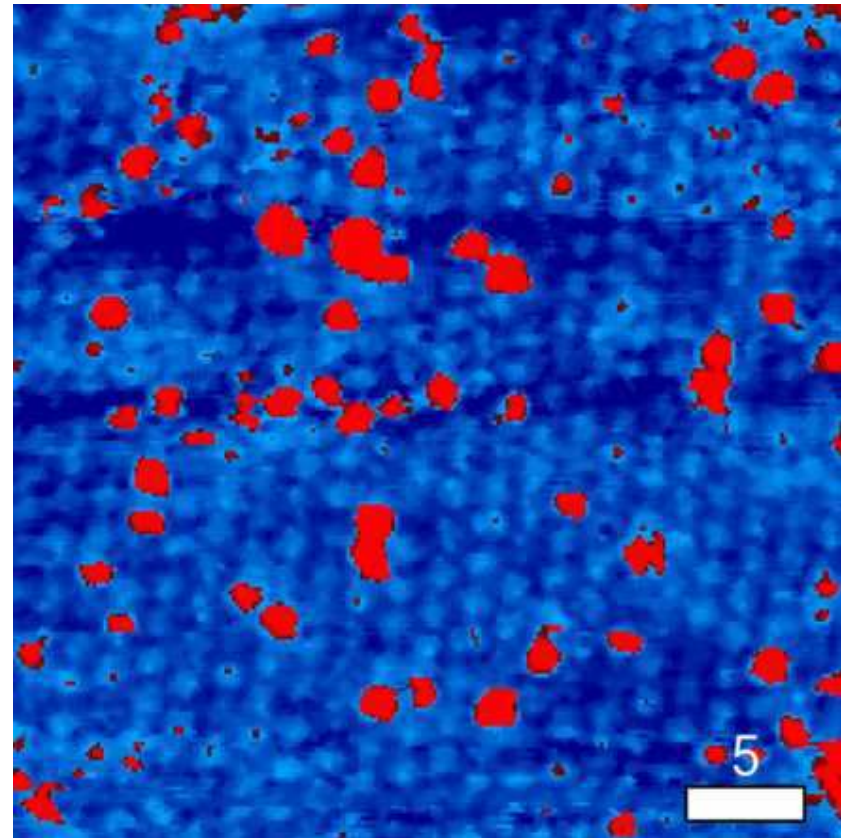
STM metingen van Mn porferines



Mn porferines met C11 R groepen
op goud ondergrond in tetradecaan

Veel zuurstof toevoegen

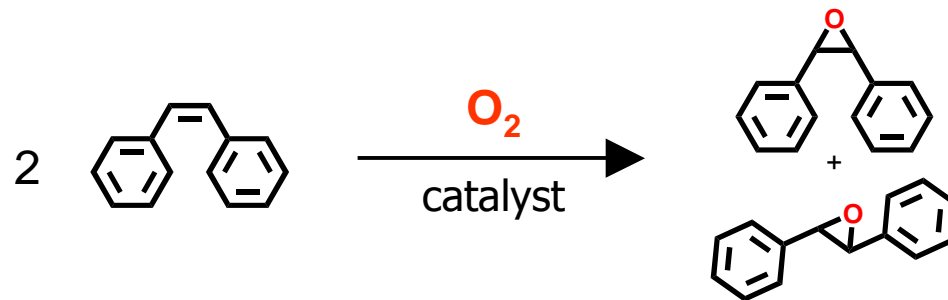
- 1 zuurstof molecuul splitst in 2 zuurstof atomen die aan kernen van porferines hechten





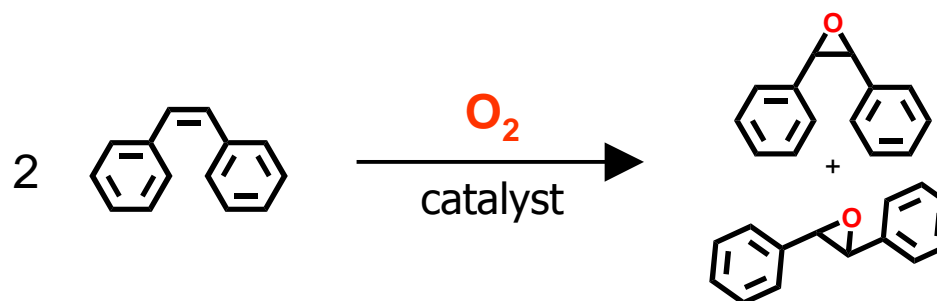
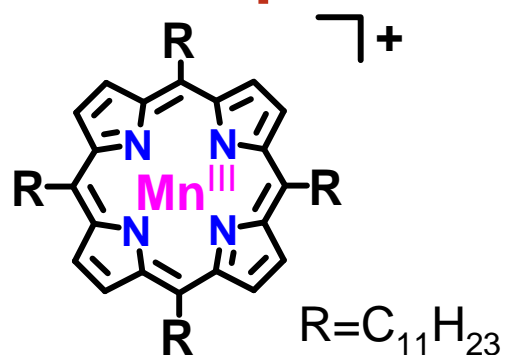
Epoxidatie

- Veel gebruikt in industrie
- Cis-stilbeen: simpel molecuul

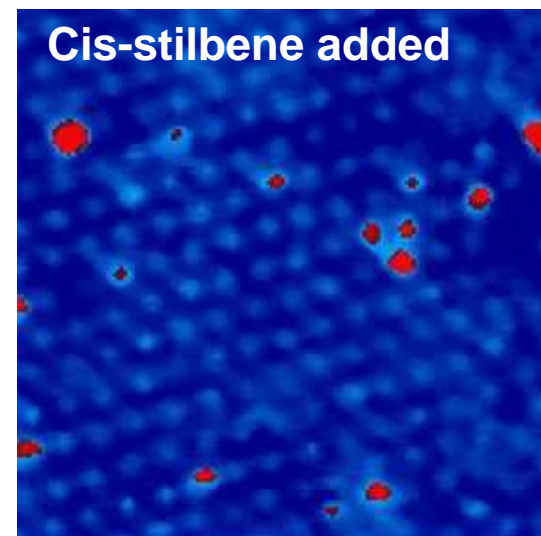
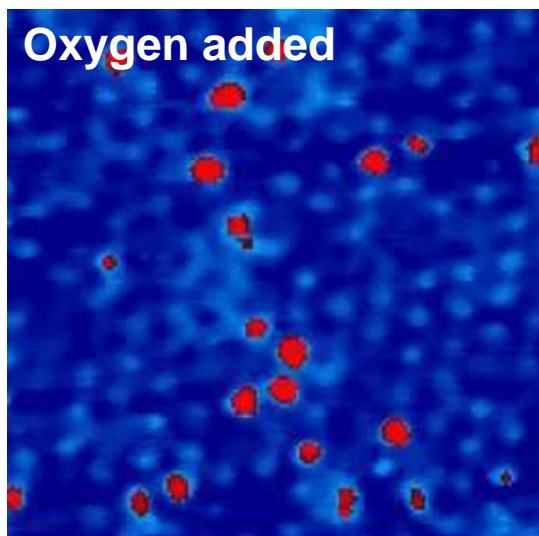
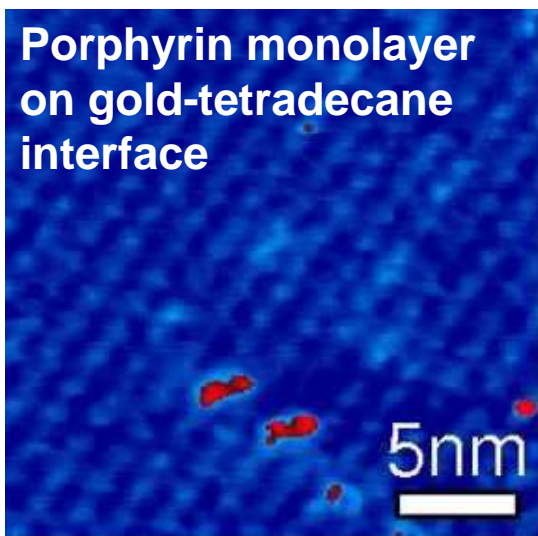




Epoxidatie reactie



Gas Chromatography shows end products





Conclusies

- Katalytische reactie op moleculair niveau bekijken
=> meer begrip kan leiden tot betere ontwerpen
=> minder afval, minder energie, minder materiaal nodig

