

Green & Biocompatible Antifouling Materials

Meital Reches

The Institute of Chemistry

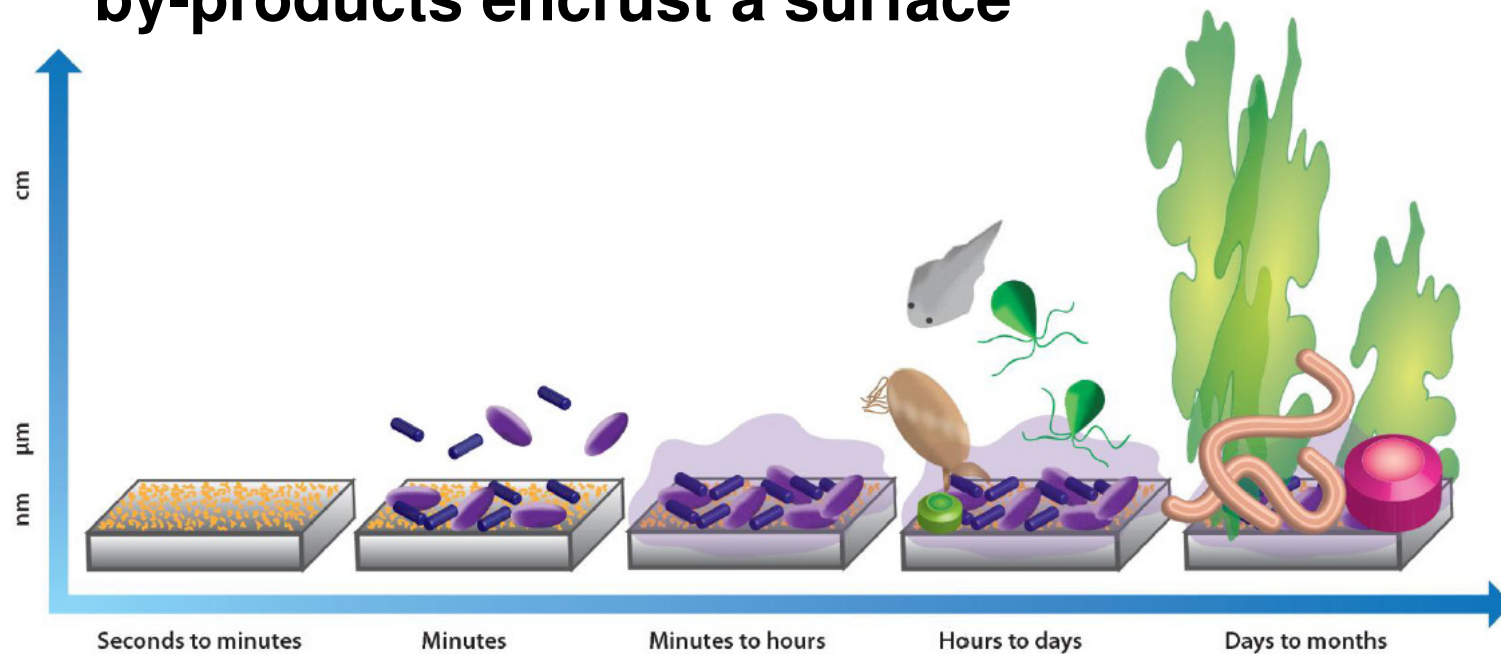
The Center for Nanoscience and Nanotechnology

The Hebrew University of Jerusalem

What is Biofouling?



A process in which organisms and their by-products encrust a surface





6,000

Deaths a year in Israel



100,000

Deaths a year in the US



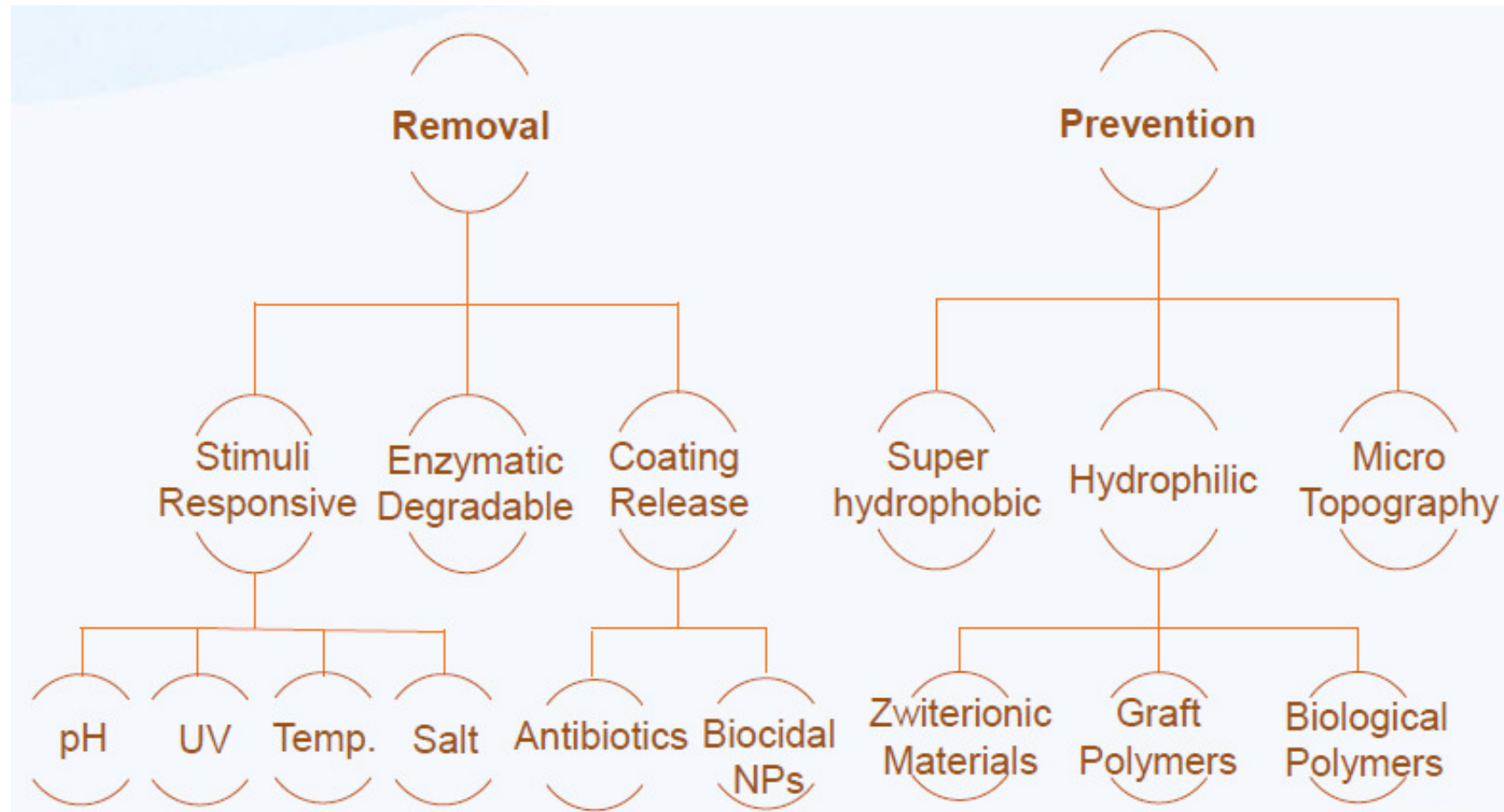
Annual Cost to Marine Industry

\$150B

Biofouling affects many areas of our lives




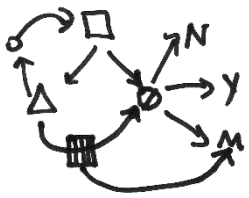



Antifouling Materials: Proposed Solutions



Drawbacks



- Toxicity 
- Lack of long-term stability 
- Restricted to certain surfaces 
- Complicated application methods 
- Expensive 

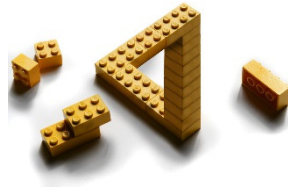
Our Solution: Peptide-Based Antifouling Coating



Peptides are not toxic



Peptides can self-assemble



Stable



The synthesis is simple and can be easily scaled up



Material design (patented)



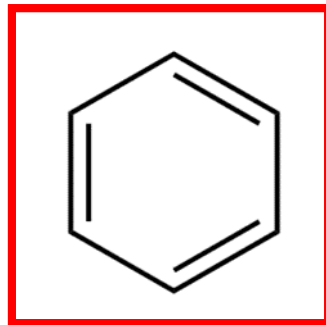
Adhesion element



From marine
mussels

+

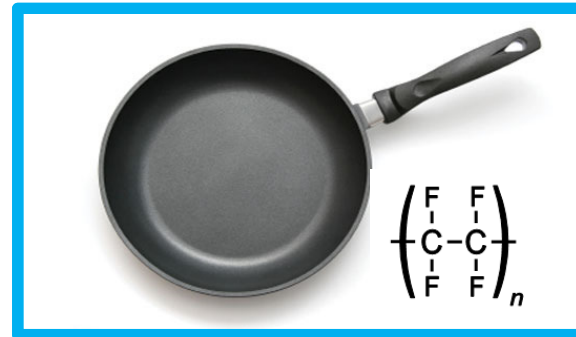
Self-assembly



Aromatic
amino acids

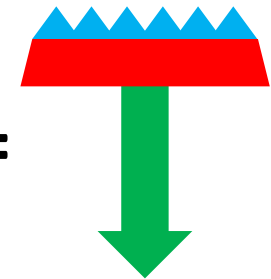
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Antifouling



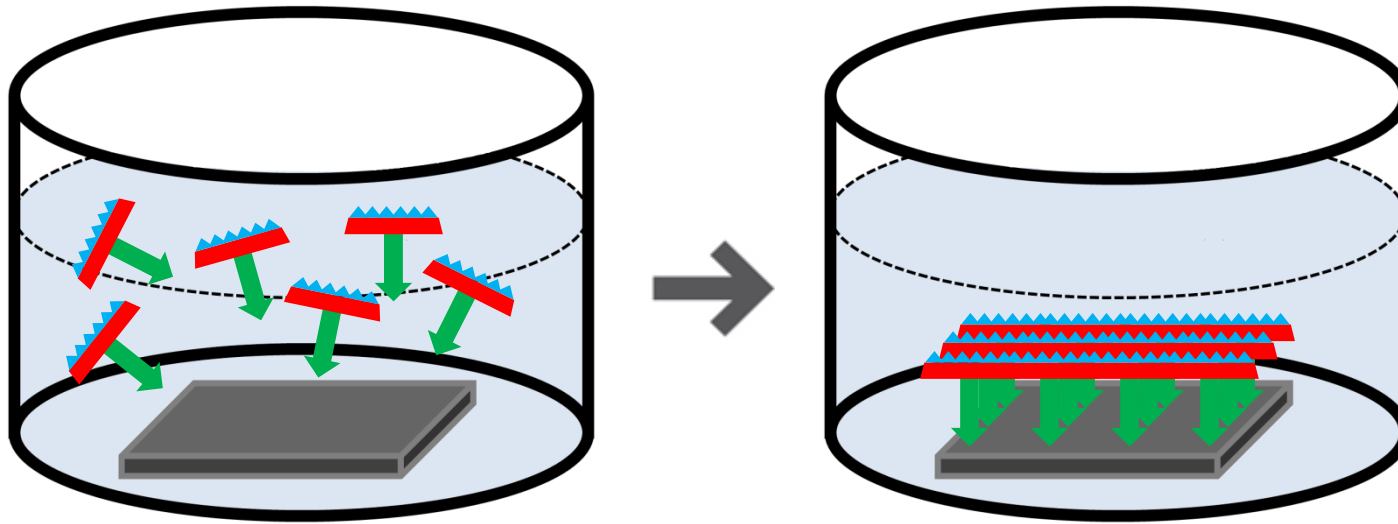
Fluorine atoms

=

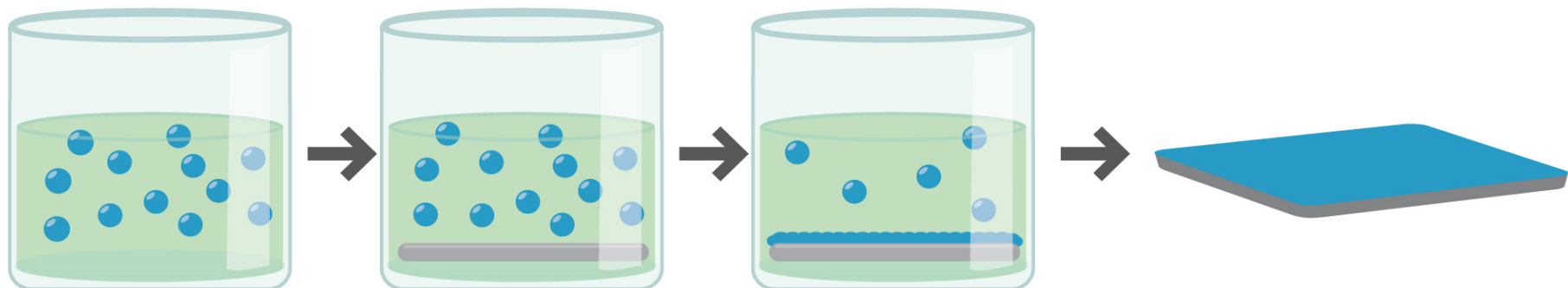


The molecule

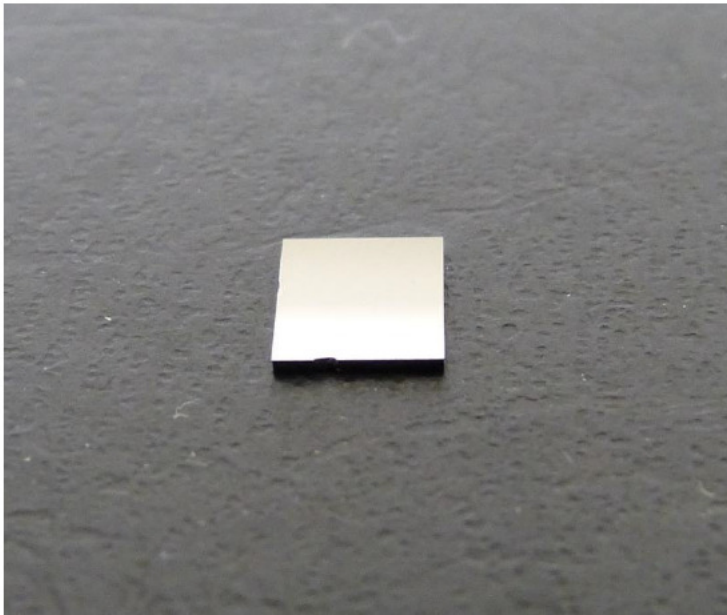
Self Assembly (dip coating)



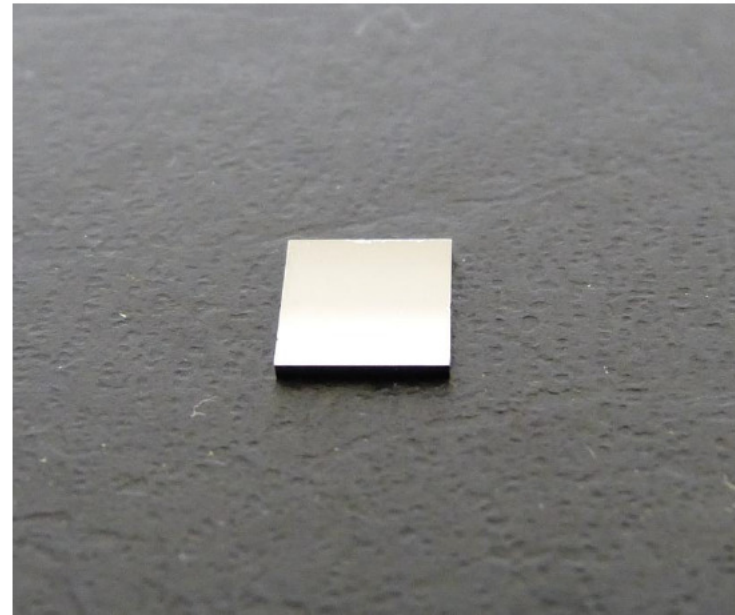
Simplicity in manufacturing:



The Coating is Transparent



Bare substrate

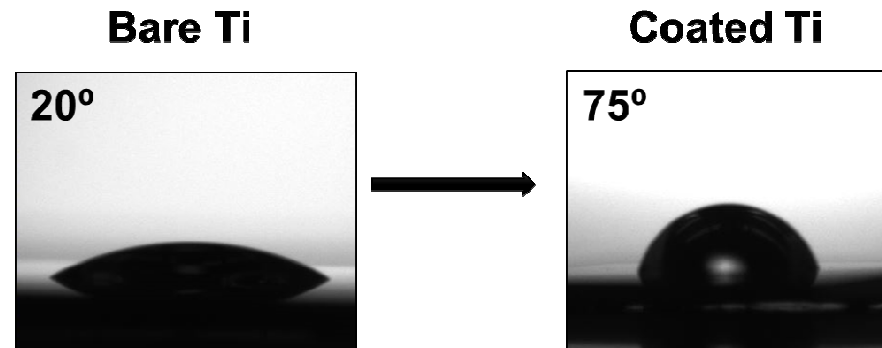


Coated substrate

The Peptide Coats Various Substrates



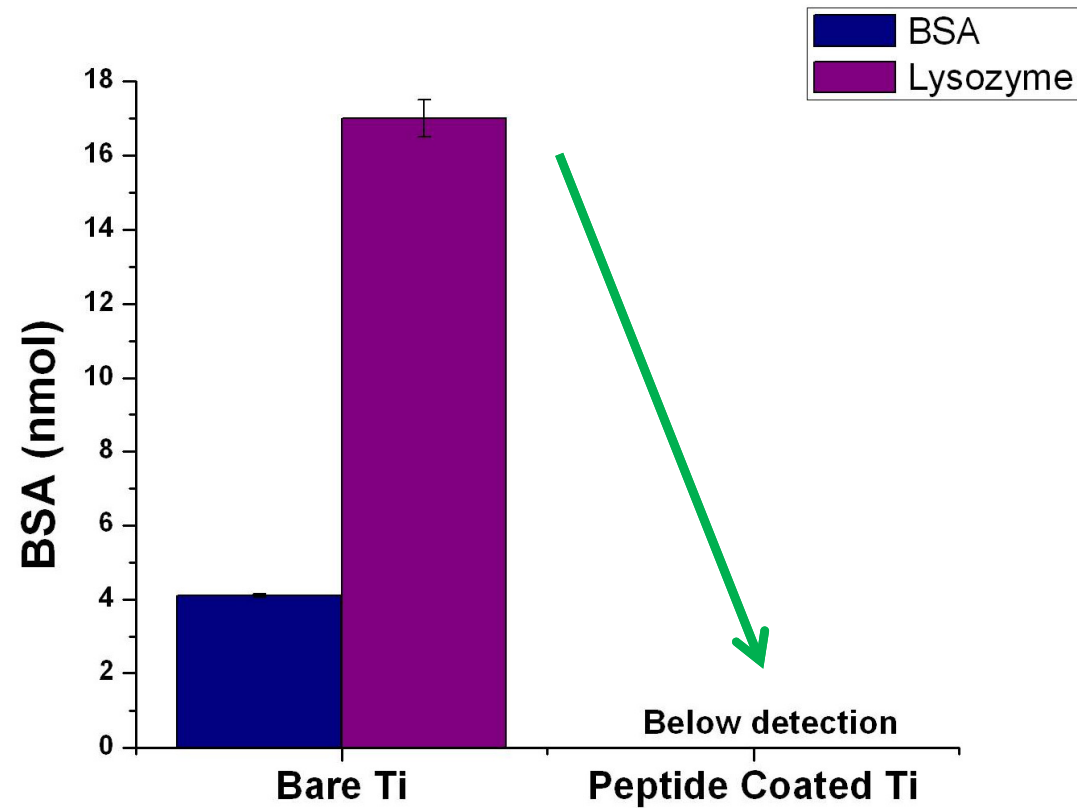
- Silicon oxide
- Gold
- Glass
- Titanium oxide
- Stainless steel
- Polystyrene
- Polypropylene
- Mica
- ABS, Plexiglass, Si Rubber





Antifouling Activity?

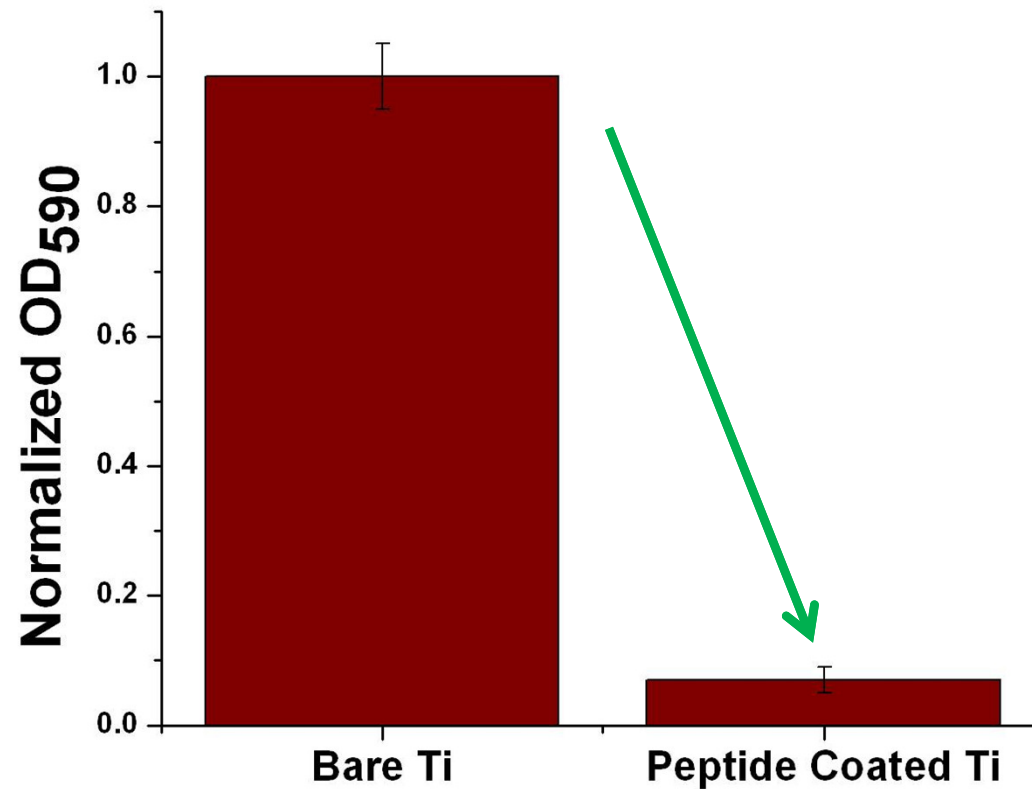
Proteins Do Not Adsorb to the Surface



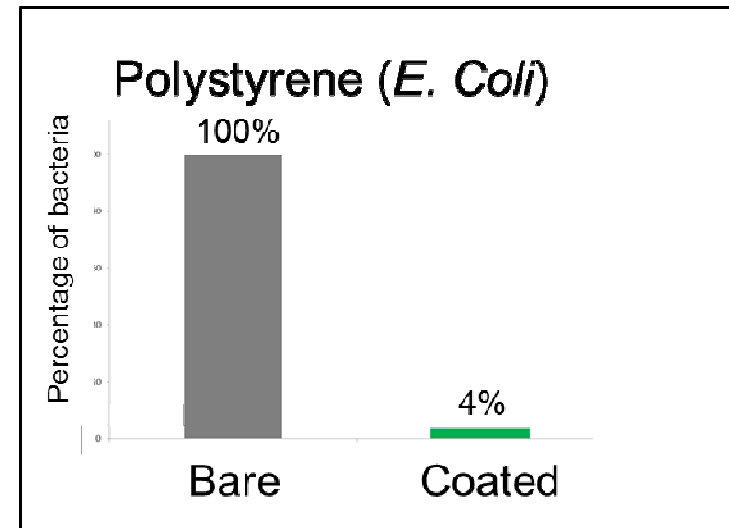
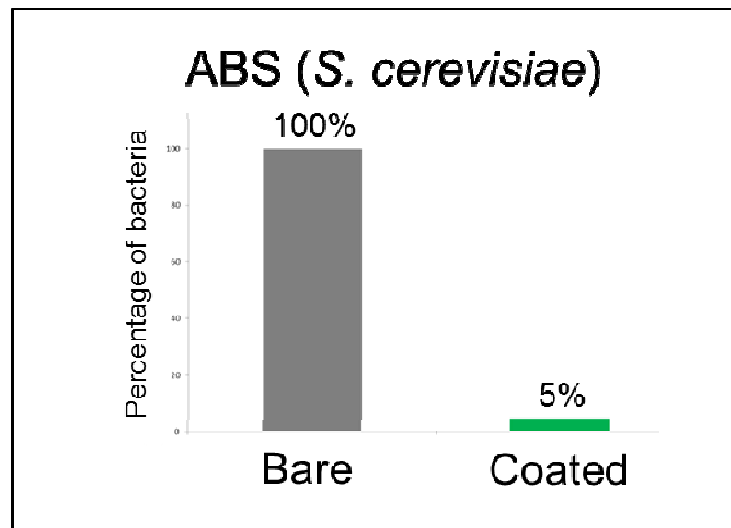
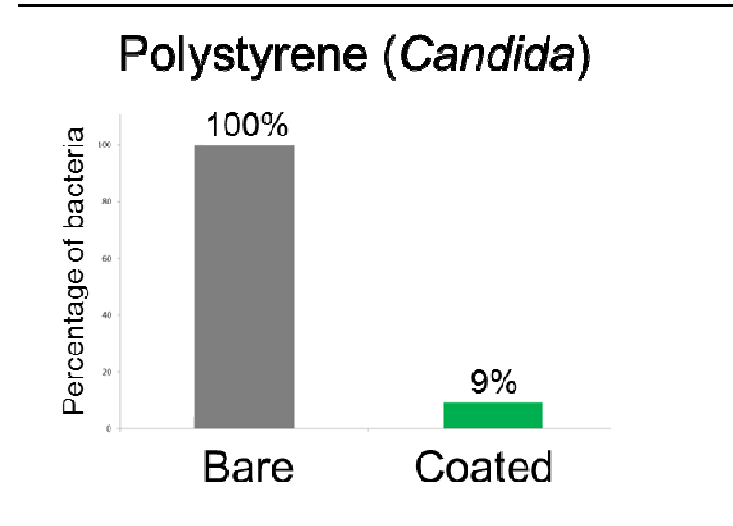
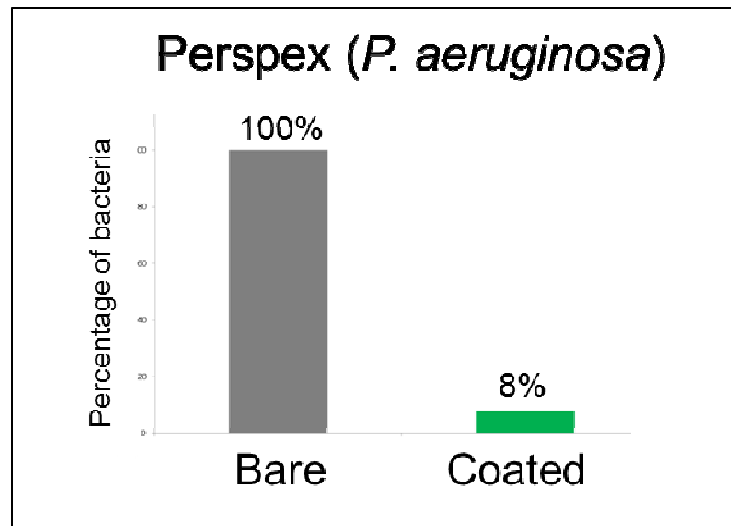
Bacteria Hardly Adsorb to the Surface



Optical density quantification of the accumulated *P. aeruginosa*, on bare and coated titanium substrates



Bacteria & Fungi Hardly Adsorb to the Surface



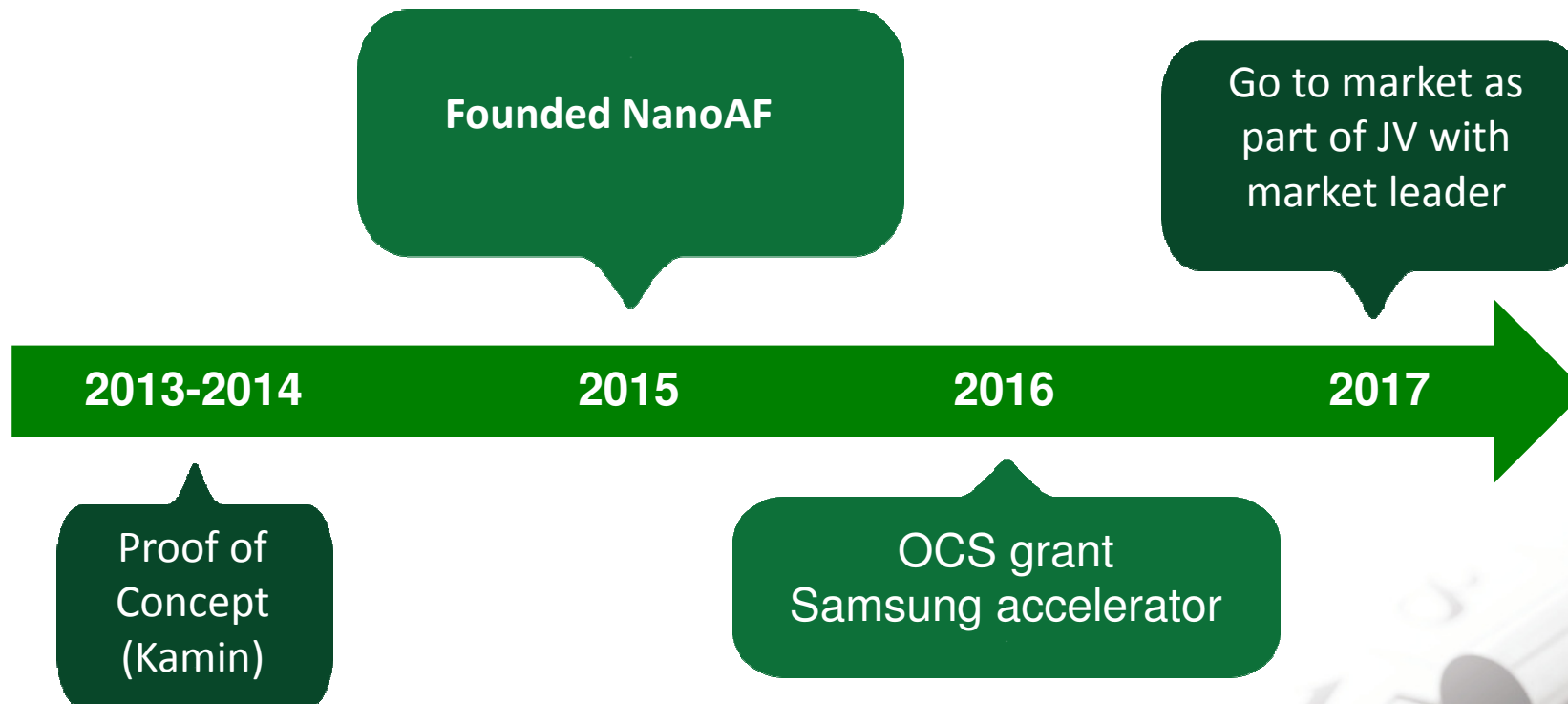
The coating is stable



- ✓ Sea water
- ✓ Various pH values
- ✓ Detergent (SDS, EDTA)
- ✓ Temperature
- ✓ Toxicity



Timeline



Takeaways



**Peptide based
antifouling**

**Not limited to a
certain substrate**

**Effortless
coating process**

**Prevents the first stage of
biofouling**

**Samples
are
available**