



СИБИРСКИЙ ФЕДЕРАЛЬНЫЙ УНИВЕРСИТЕТ
SIBERIAN FEDERAL UNIVERSITY



Prospects of “Unipolymer” application in marine ecology

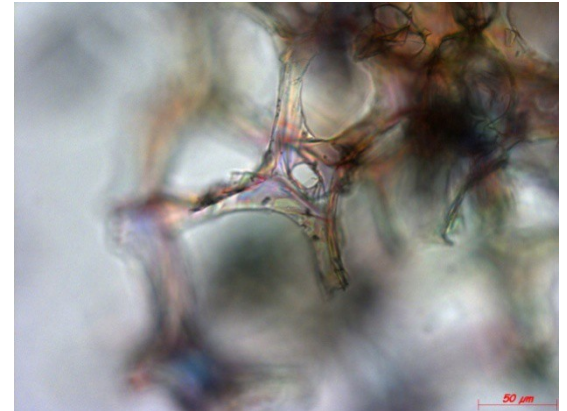
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Structure of presentation

- Polymer composite “Unipolymer”
- Cooperation proposals towards:
 - “Unipolymer” application in marine ecology
 - Biosensors development



Polymer composite “Unipolymer”

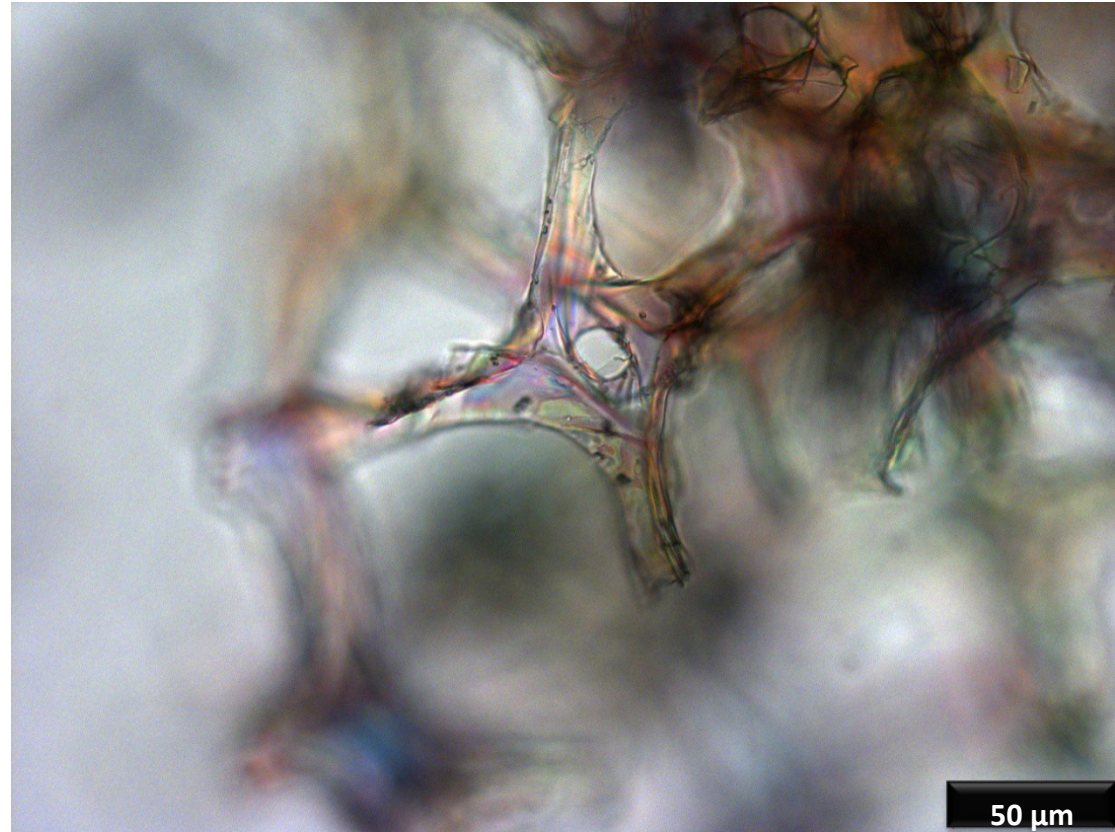
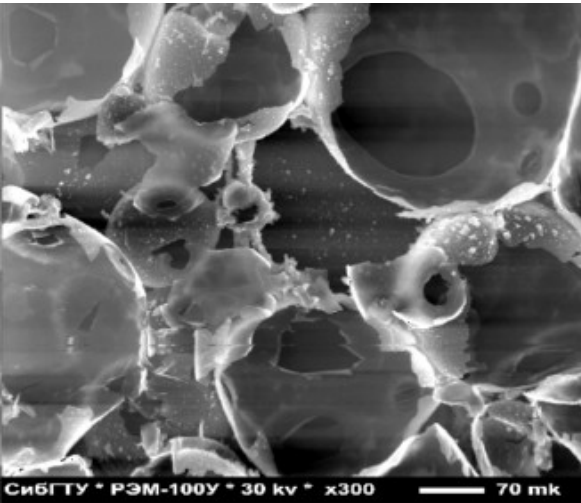
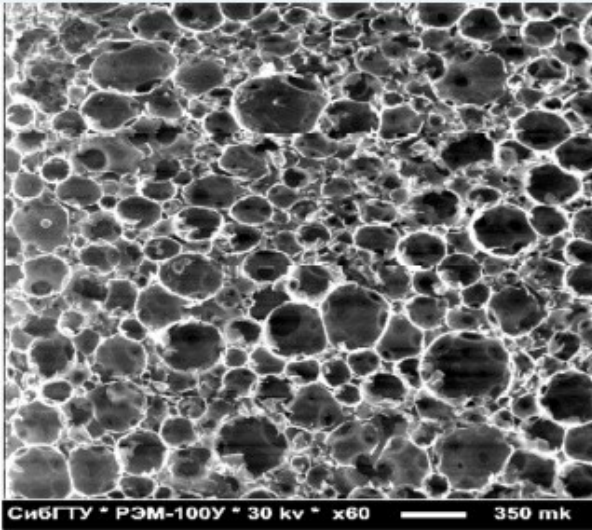
- Developed at Siberian Federal University about a decade ago.
- Patented:
WO 03/055596 A1
RU 2411267 C1
- Unipolymer-M & Unipolymer-bio



Picture of Unipolymer-M

Mesh structure of the polymer

SEM images of “Unipolymer”
slice (Mironov et.al. 2007)



Optical Microscopy of “Unipolymer” © MOLPIT

Properties of the polymer

Property	Value
Density of the initial composite	4 – 25 kg/m ³
Humidity	0 – 6 %
Buoyancy	100 %
Sorbent capacity	43 – 67 g oil / g sorbent
Sorption rate	0.8 – 1.5 mm oil / s
Return of collected oil	95 – 97 %
Working temperature	– 25 + 300 °C
Biodegradability	100 %
The porosity of the sorbent	Up to 93 %
Desorption	0 %
Flammability	Weakly flammable

The mechanism of sorption

- Wetting of oil by “Unipolymer”

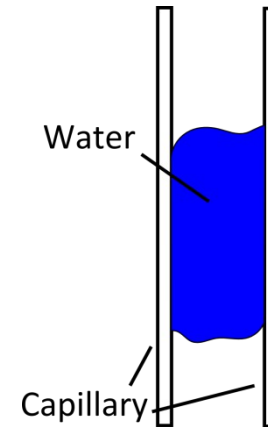
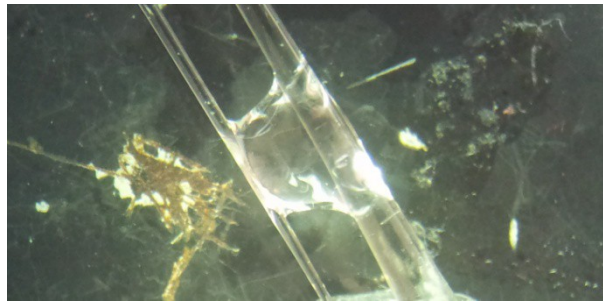
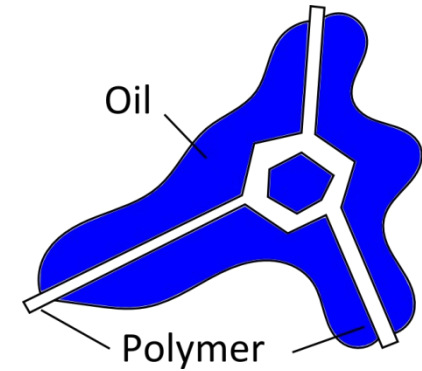
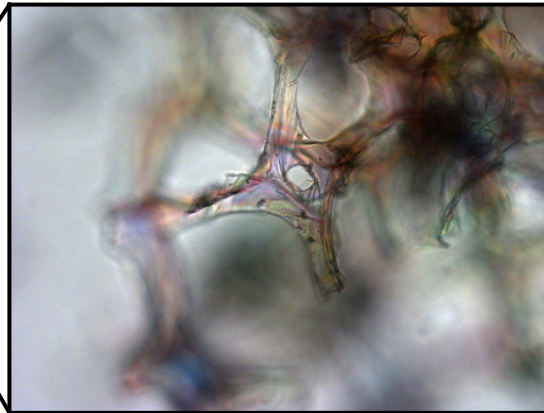


Illustration of wetting power by the example of the glass capillary and water

Applications of Unipolymer-M & Unipolymer-bio



Oil sorbent



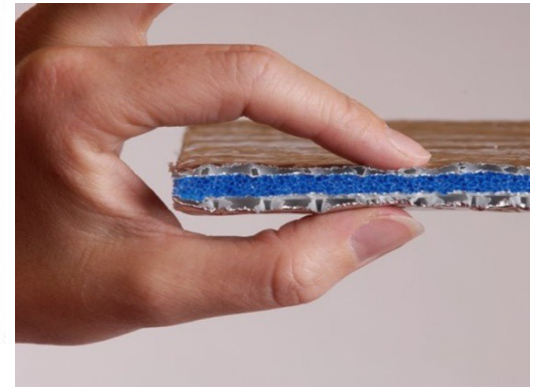
Soil former



As a matrix for
(marine) bacteria



Thermal insulation
covering for northern
soils



Thermal insulation
material for houses

1st proposal. How to use “Unipolymer” in marine ecology?

Subject for collaborative study:

- Investigate biophysics of “Unipolymer” to improve marine ecological safety

Areas for studies:



Joint research of
“Unipolomer” characteristics
for marine ecology

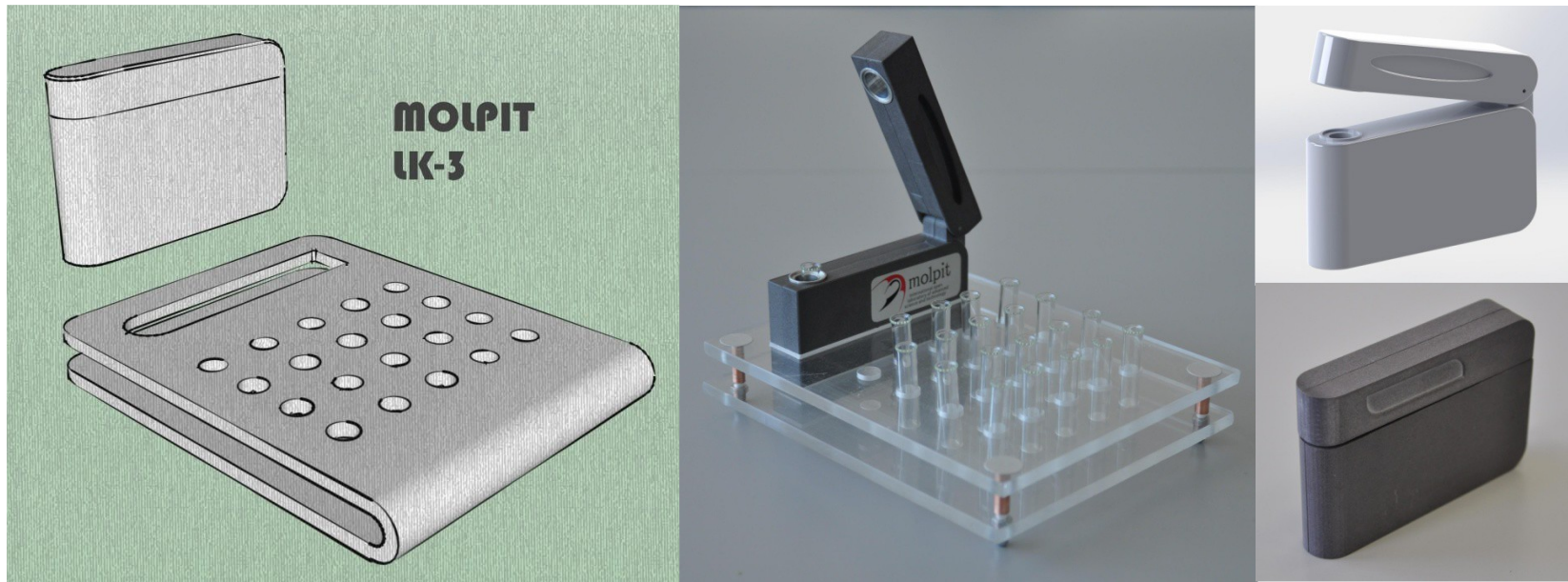


Ecological protection and
pollution sensor
(e.g. coastal area)

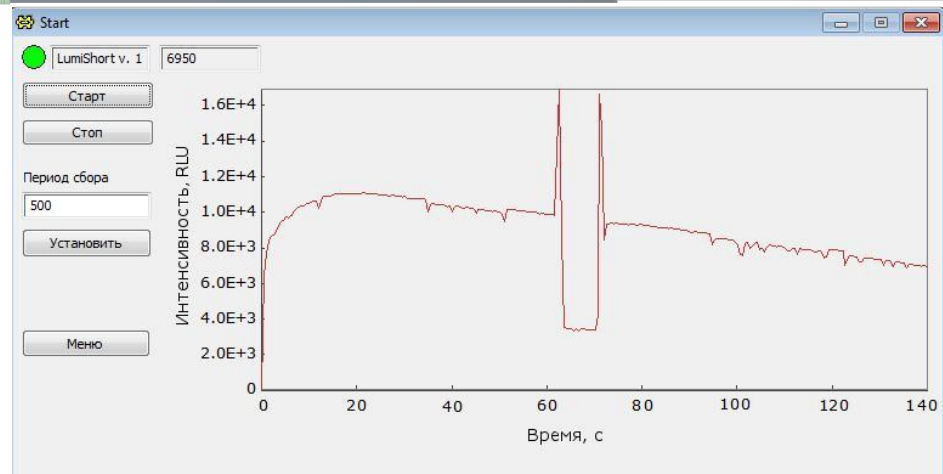


Experimental "in vitro"
study of “Unipolymer”
at the sea

Development of a portable laboratory for toxicity analysis

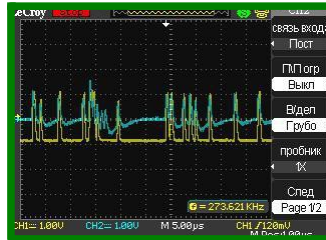
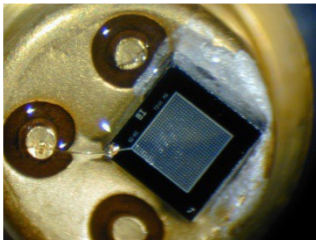


- Prototype of portable cuvette bioluminometer has been developed and successfully used

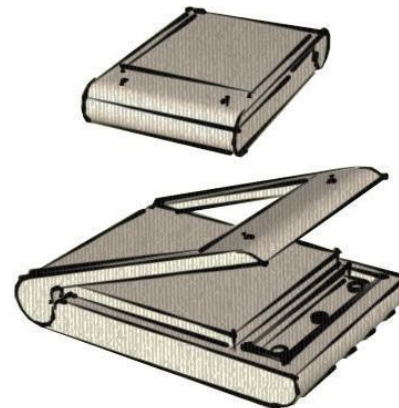
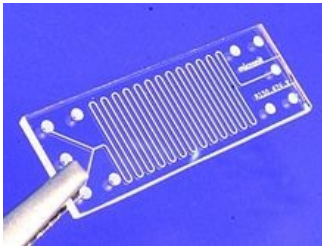
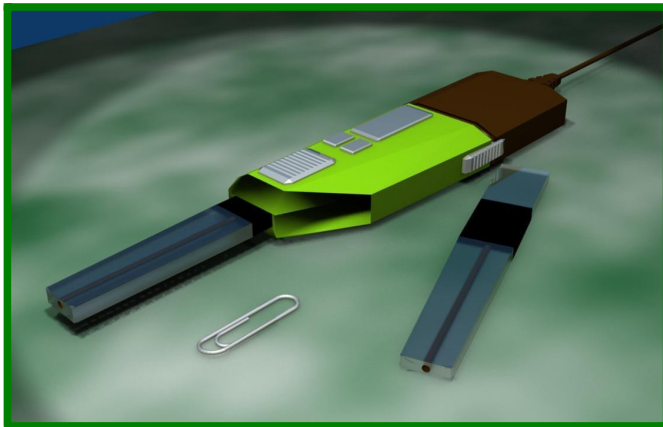


Development of portable bioluminescent biosensors for ecology and medicine

Lab-on-a-chip + SiPM + Enzimolum™ = *LumiChip*™



- A concept, body, electronics and chips for personal ecological safety device has been developed.



2nd proposal. Biosensor development

Subject for collaborative study :

- Biosensors development for ecological defense and marine engineering

Areas for studies:



Biosensors development:
“Unipolymer”



Field testing of biosensors at the sea

Pick up notes (10.07.13)

Thoughts for round table

Let's discuss:

1) Unipolymer sea booms



2) Unipolymer life islands. Why? As Unipolymer forms soils, why don't we form life around Unipolymer?



3) Unipolymer as catalyst for natural aquaculture