NAMED

International Hellenic University

European Union
European Regional Development Fund

HELLENIC REPUBLIC
Ministry of Economy and Finance
Special Secretariat for ERDF & CF Programmes
Managing Authority of "Competitiveness" Programme

GSRI
GENERAL SECRETARIAT FOR RESEARCH AND INNOVATION

EPAnEK 2014-2020
OPERATIONAL PROGRAMME
COMPETITIVENESS
ENTREPRENEURSHIP
INNOVATION

ΕΣΠΑ 2014-2020
ανάπτυξη - εργασία - αλληλεγγύη
Partnership Agreement
2014 - 2020

Co-financed by Greece and the European Union

Nano-filtration membranes

Conductivity of sea water=52.4 mS/cm

Conductivity of filtered sea water=49.6 mS/cm

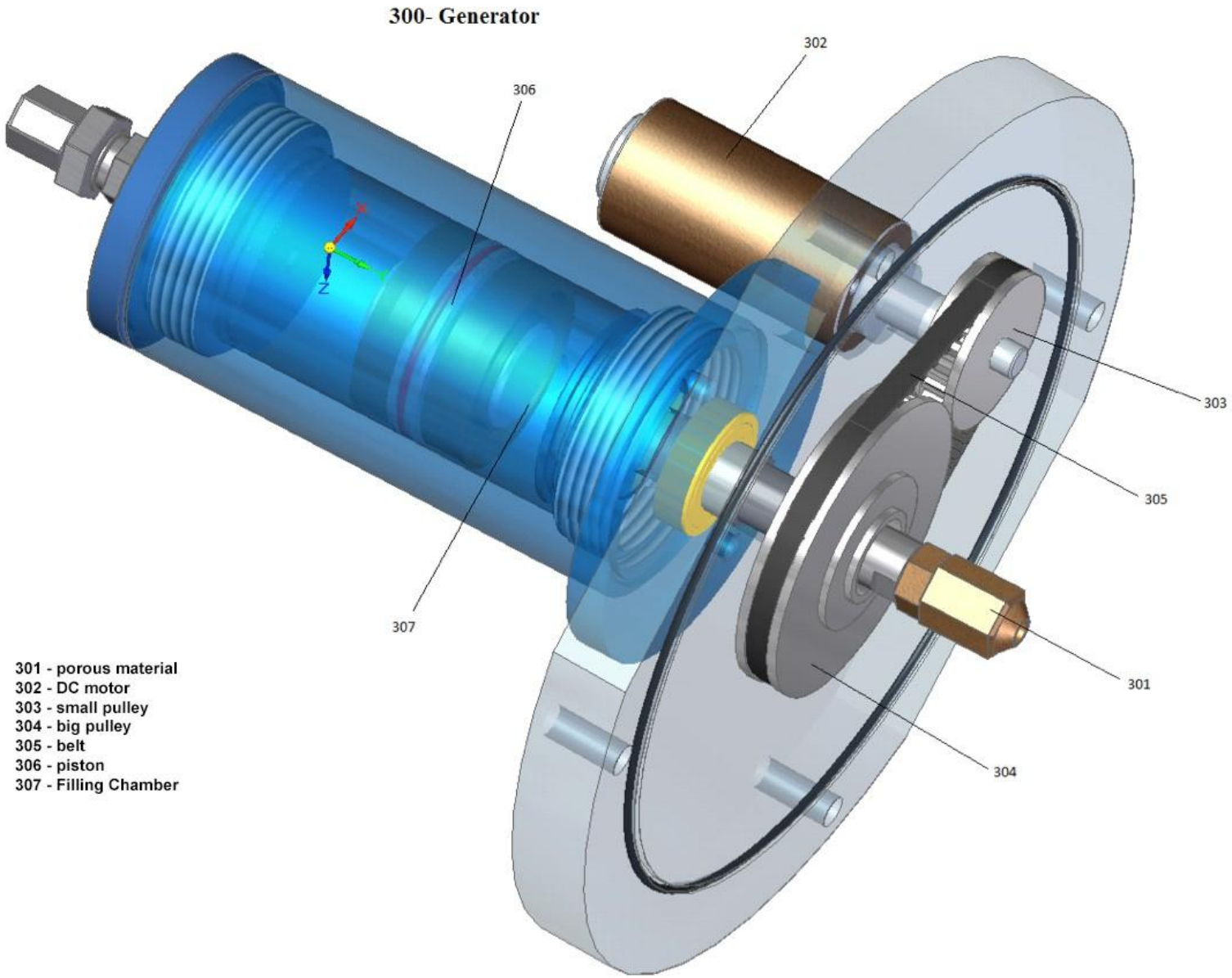
NF membranes are not very effective; it should be coupled with another method (e.g. NB pre-treatment).

Support frame of NF membranes was rather large ($6x6mm^2x2mm$).

A new metallic support frame of about $0.4x0.4x0.4mm^3$ is developed and expected to give better results.

Metallic support

NB-generator



NB tap water treatment

Nanobubble treatment of tap water shows a decrease in heavy metals, apart from those contributing to the porous plug of the NB-generation.

A different pump to overtake this problem is under construction.

ΈΚΘΕΣΗ ΔΟΚΙΜΗΣ

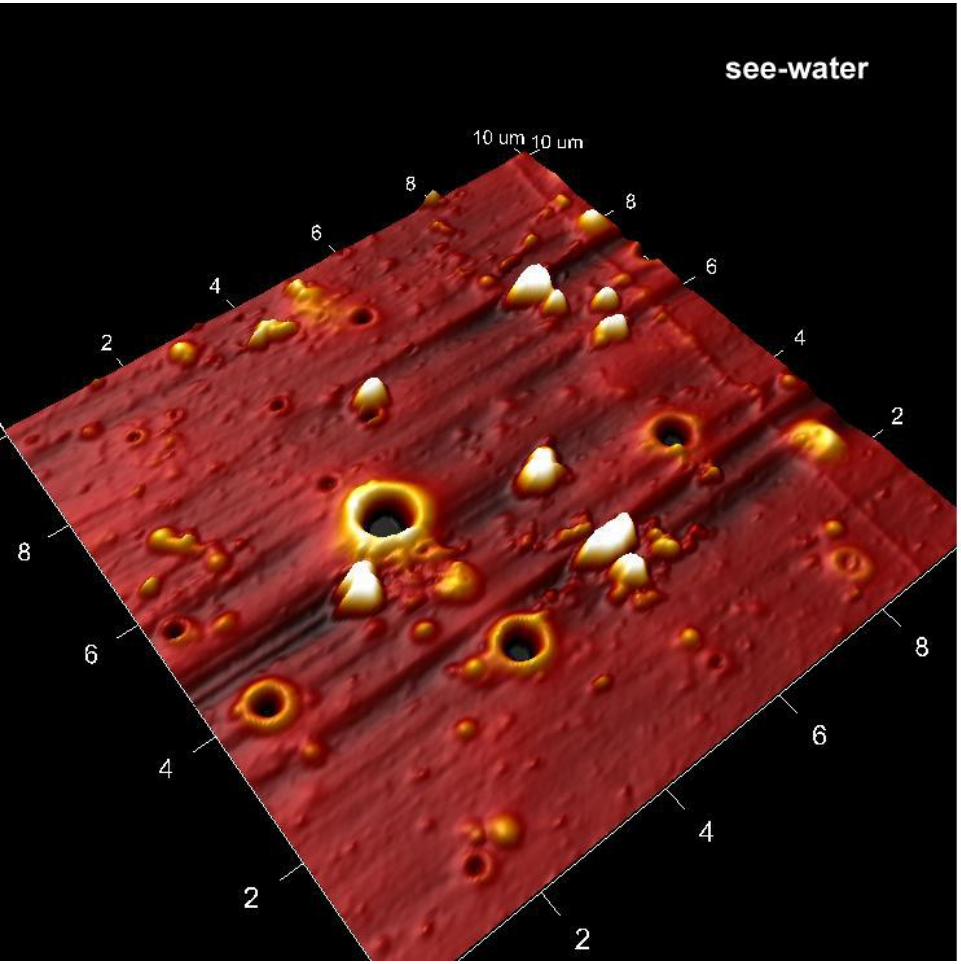
Κωδικός δειγμάτων:

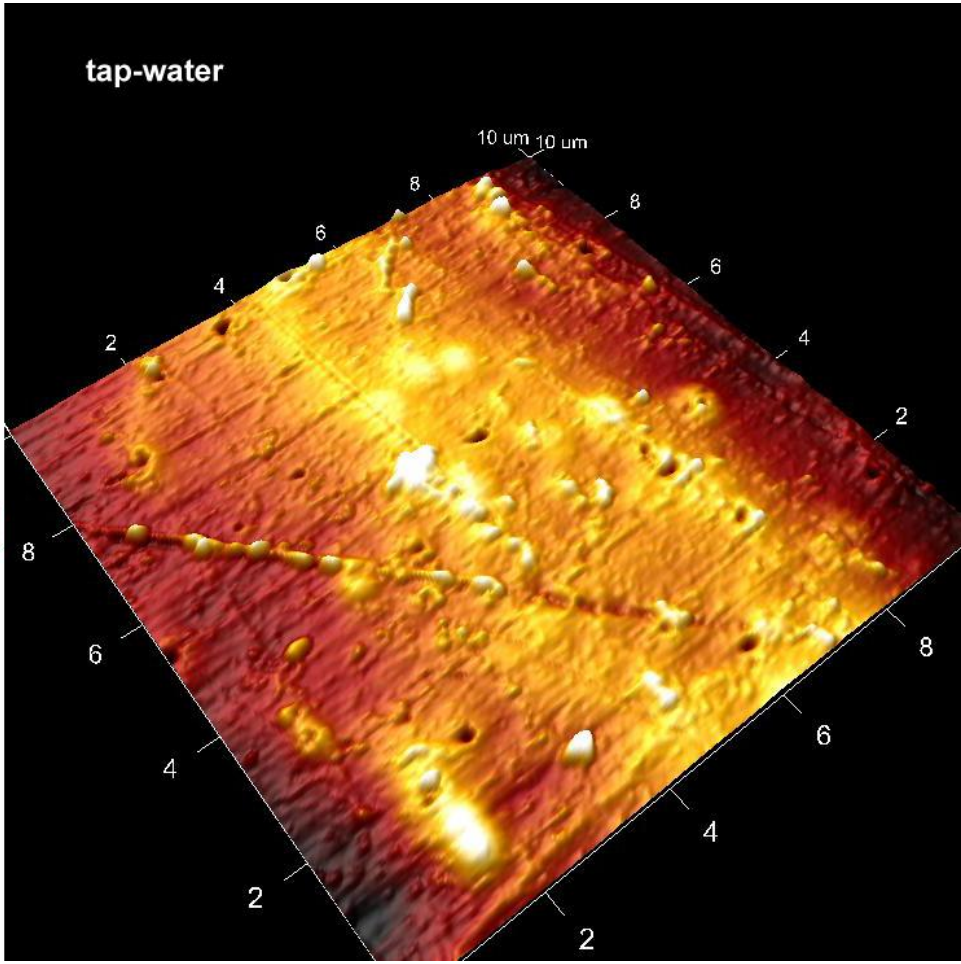
Ημερομηνία δειγματοληψίας: **Ημερομηνία Ανάλυσης:** 30-12-2020

Μέθοδος Ανάλυσης: ICP-MS

	Κωδικός δείγματος	ΠΑΡΑΜΕΤΡΟΣ (μg/L)																				
α/α		7Li	9Be	11B	27Al	51V	53Cr	55Mn	56Fe	59Co	60Ni	63Cu	66Zn	75As	77Se	88Sr	95Mo	111Cd	137Ba	202Hg	208Pb	209Bi	238U
1.	TAP WATER	4.7	0.0	4.4	0.6	0.6	2.0	0.6	5.3	0.3	1.8	20.9	709.2	0.6	0.3	211.3	2.2	0.4	13.2	0.1	10.1	0.0	1.5
2.	RESIDUAL WATER	5.6	0.0	6.8	25.6	0.5	1.2	3.4	-2.7	0.3	37.9	215.4	119.5	0.4	0.3	105.6	2.4	0.0	12.8	0.1	5.1	0.0	0.5
3.	TREATED WATER	5.0	0.0	5.6	7.8	0.5	0.6	1.6	-2.6	0.3	41.8	381.3	118.0	0.4	0.2	100.4	2.2	0.0	8.5	0.1	2.2	0.0	0.4

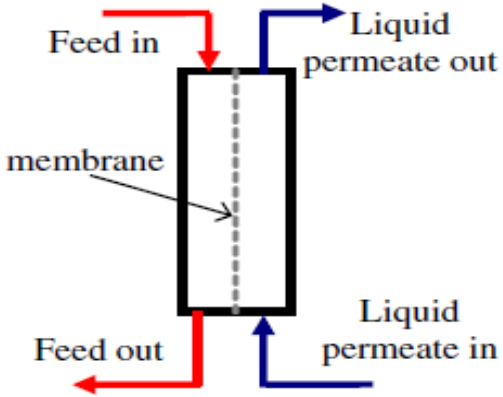
AFM

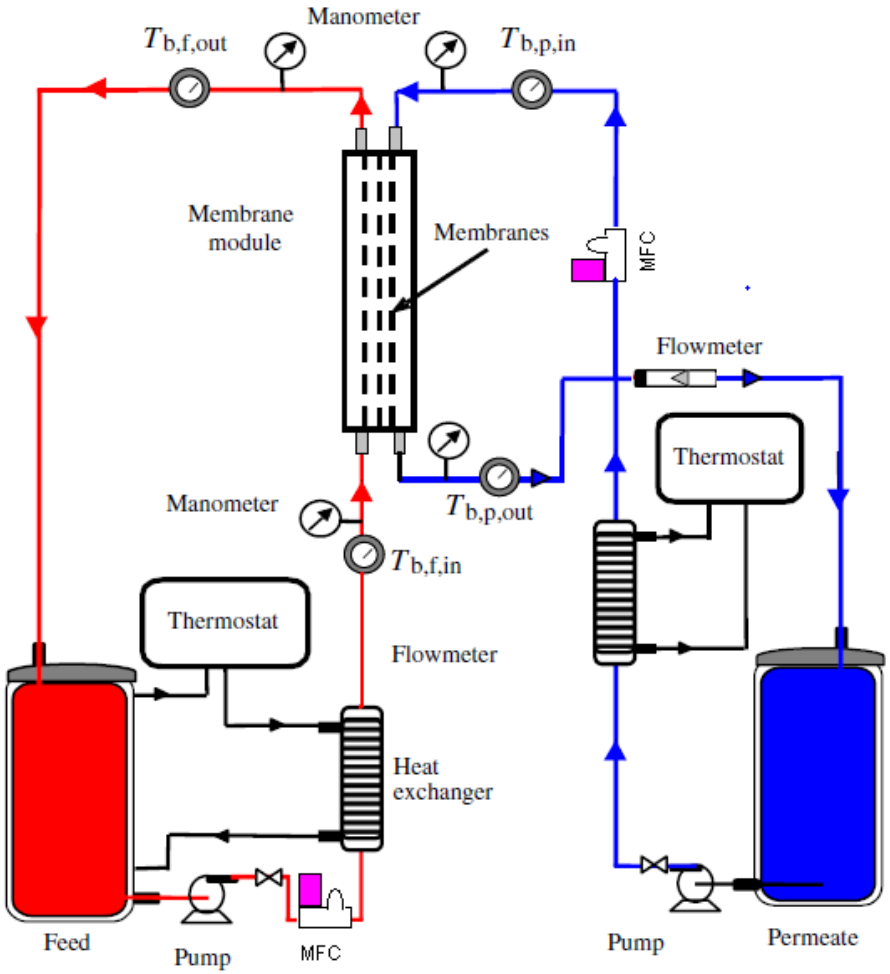




AFM images for sea-water and for tap-water NF show different mechanisms.

Direct Contact Membrane Distillation - DCMD





PIM

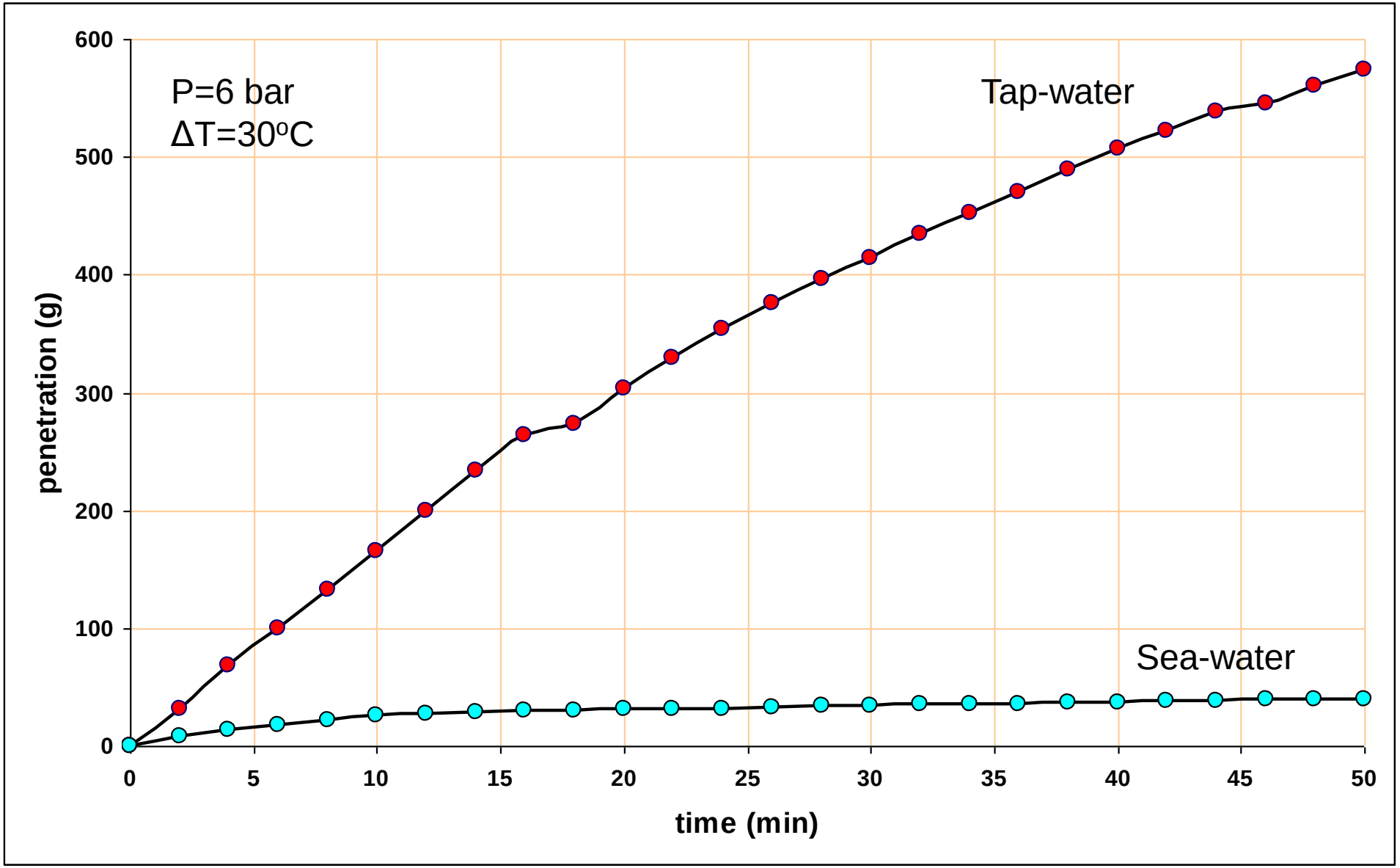
Two different membranes were examined, coded as: 66.1-66.2 m GKSS and 66.3-66.4 m GKSS.

Both membranes are impermeable to liquid water due to hydrophobicity.

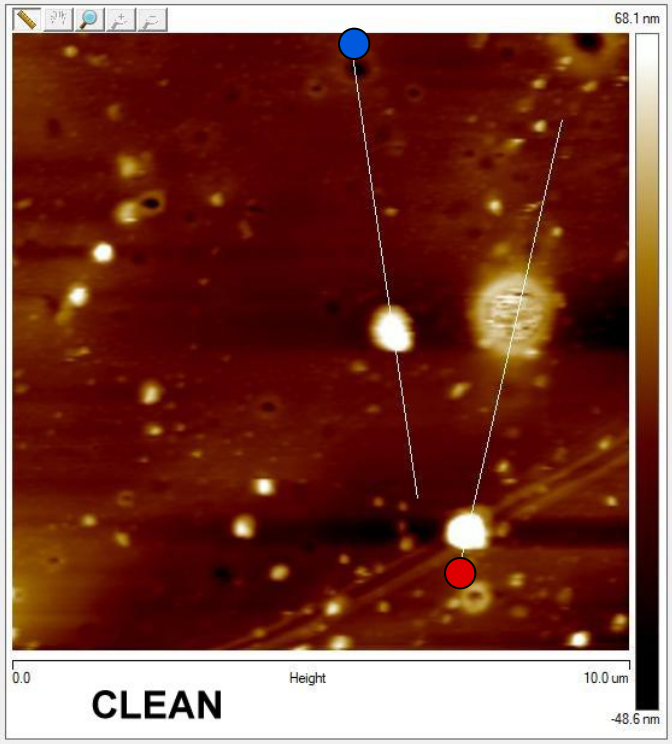
Membrane distillation shows that the first type of membrane gives good result at pressure of about 1 bar and ΔT of about $30^{o}C$, while second type of membrane needs more pressure (~6 bar) for the same ΔT.

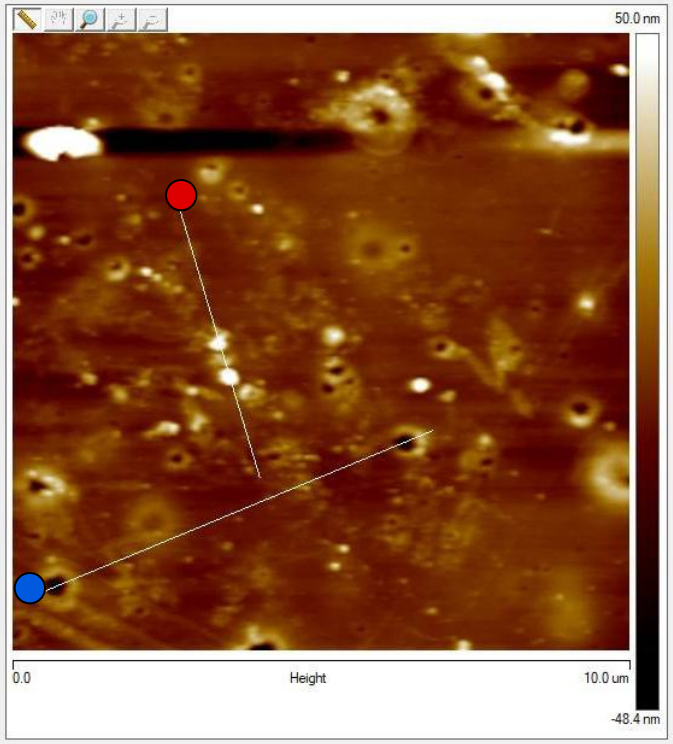
Conductivity between seawater and membrane distilled sea water, was dropped from 70.9 to 61.1 mS/cm.

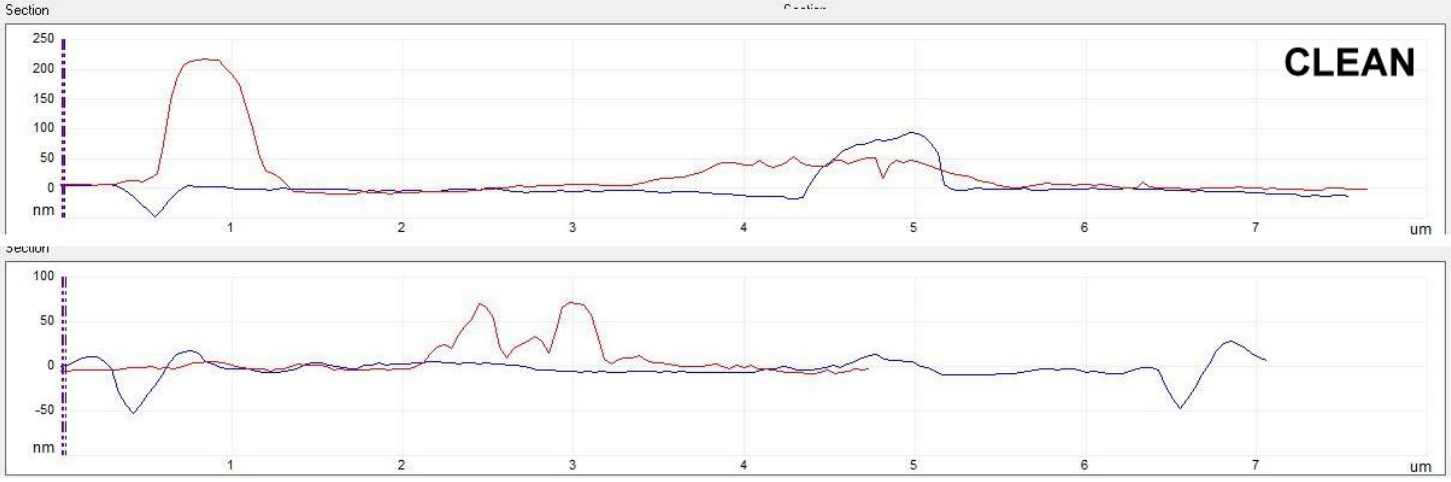
PIM-membranes: Penetration of tap and sea water



AFM



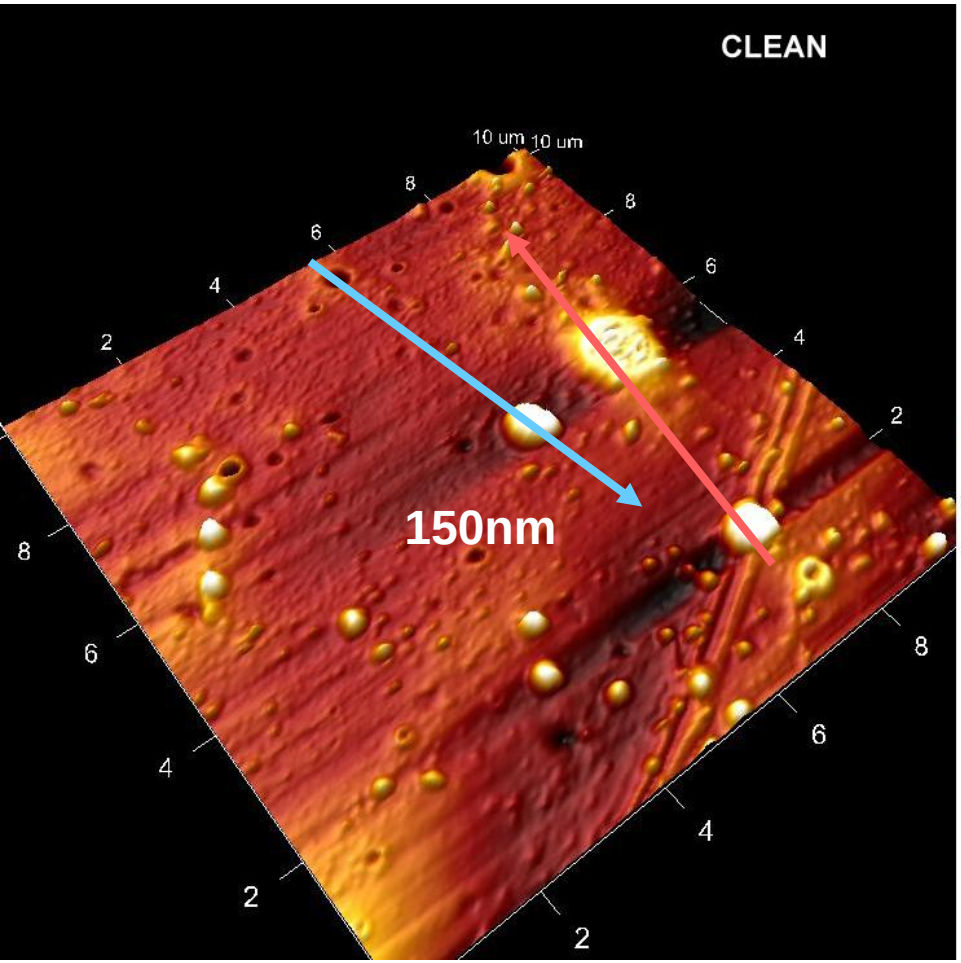


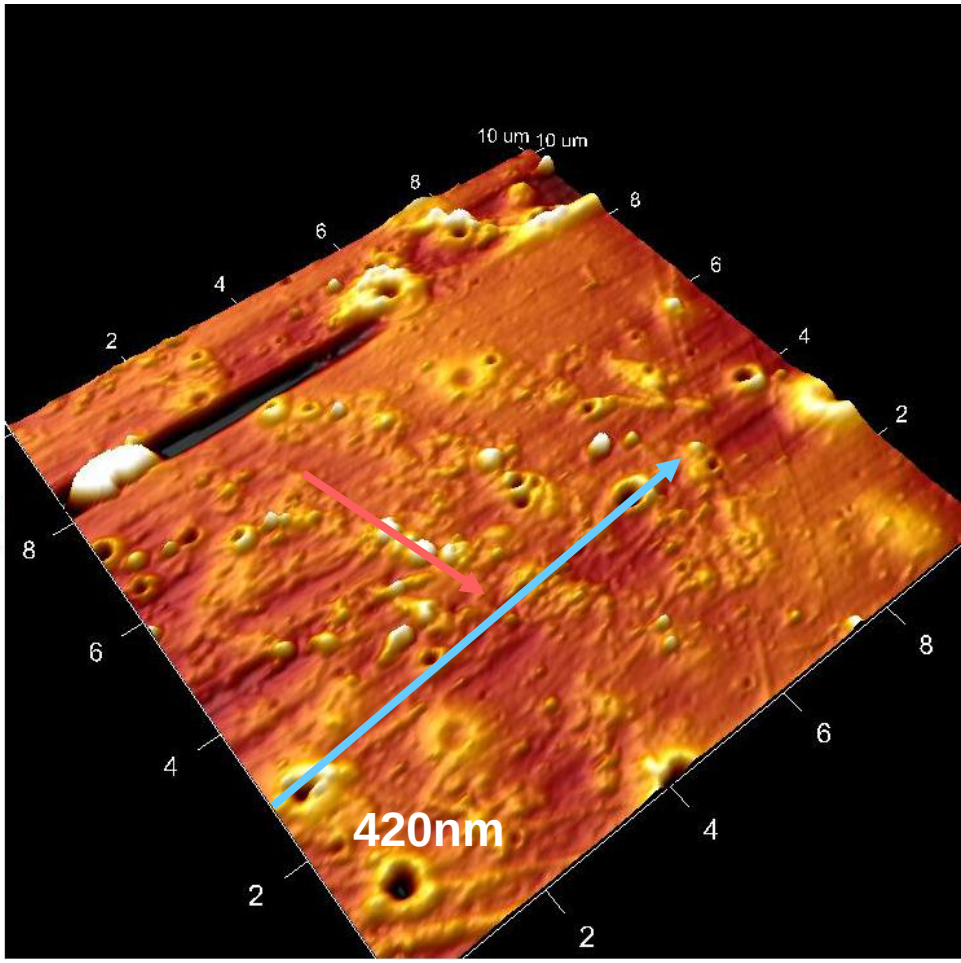


For clean membranes the craters are about 50nm and the bumps ~100nm.

After MD craters are the same but bumps get penetrated.

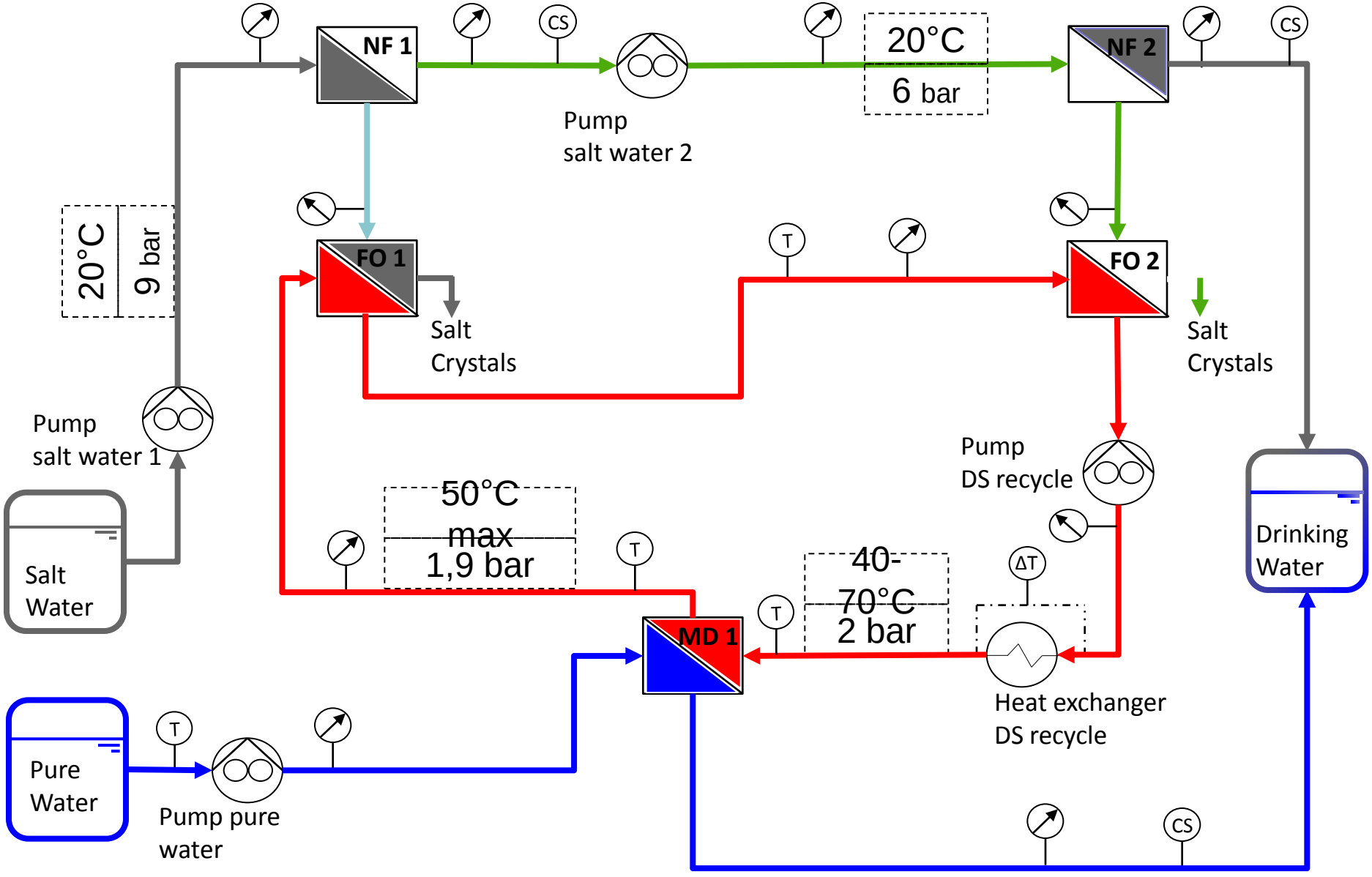
AFM

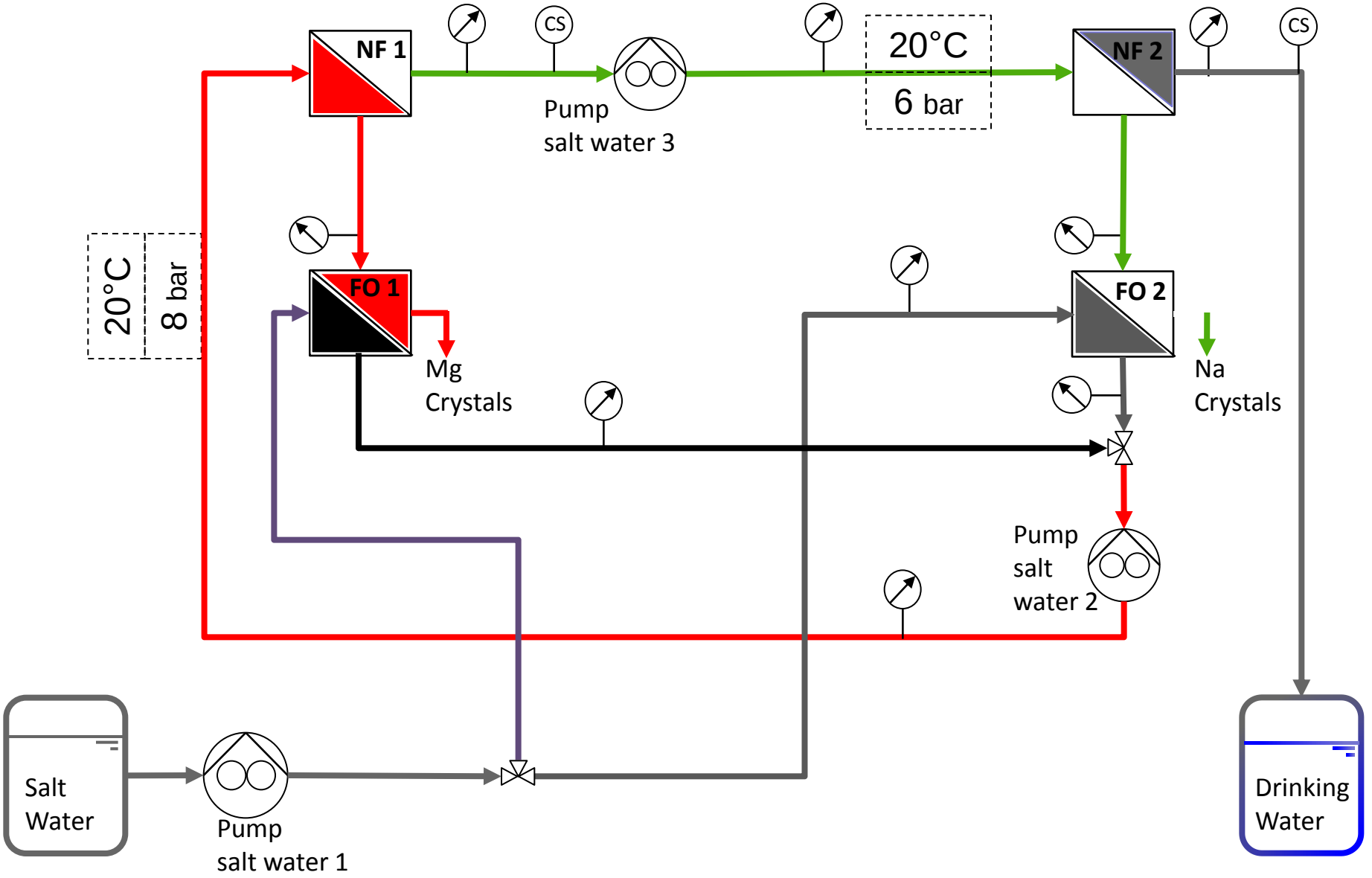




AFM analysis shows that the MD process changes the surface of the PIM membranes . Some craters and bumps are present before MD process, which are changed in after MD.

Pilot Unit Schematic




NF 1
CS
Pump
salt water 3
20°C
6 bar
NF 2
CS
20°C
8 bar
FO 1
Mg
Crystals
FO 2
Na
Crystals
Pump
salt
water 2
Salt
Water
Pump
salt water 1
Drinking
Water

2nd German-Greek Workshop

- 01-June-2021 11:00-12:00 CET preparatory meeting or
- 10-June-2021 11:00-12:00 CET preparatory meeting

- 14-June-2021 12:00 pm upload of canvas template
- 18-June-2021 decision of oral presentation (5 min)

- 30-June-2021 08:00-12:15 main event

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Resources

- …

Team

- We need more time to complete the project.
- A good mixture of basic + applied
- Good experience in experimental development

Applications

Tools Sensors

Membrane for gas separation

Problem

- …

Solution

- …

R&D Results

- Membrane performance
- Knowledge
- DATA

Transfer Goals

- Economical exploitation of projects is not easy
- Further action is needed to reach this goal

Users

- Food industry

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Transfer Basis | **Value Proposition**

Transfer Goals • Economical exploitation of projects is not easy • Further action is needed to reach this goal	**R&D Results** • Membrane performance • Knowledge • DATA	**Problem**	**Users** • Food Industry
Transfer Channel	**IP Rights**	**Application** • Tools • Sensors • Membrane for gas seperation	**Solution**	**Benefits**
Team • We need more time to complete the project. • A good mixture of basic + applied • Good experience in experimental development	**Resources**		**Partners**
Competitors & Substitutes			

Input

Competition

- Thank you for your attention
- Co-financed by the European Regional Development Fund of the European Union and Greek national funds through the Operational Program Competitiveness, Entrepreneurship and Innovation, under the call "title NAMED (project code: Τ2ΔΓΕ-0597)