
National Technical University of Athens
National and Kapodistrian University of Athens
OpenTox
Effect of nanostructured titanium dioxide on photoinduced cancer treatment
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Prof. Evangelia A. Pavlatou
OPENTOX EURO 2018, 9-11 OCTOBER 2018, ATHENS, GREECE

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Postdoc-Research Scholarships IKY
Operational Programme
Human Resources Development
Education and Lifelong Learning
Co-financed by Greece and the European Union
European Union
NSRF 2014-2020
OpenTox

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Nanomedicine
Cancer
Research
Laboratory
Biology
Cell Death
Cell Toxicity
Drug
Medicine
Physics
Delivery
Titanium Dioxide
Systems
Richard Feynman
Characterization
Nanoparticles
Smart
CELLS
Engineering
Pharmaceuticals
Biomaterials
Nanotechnology
Therapy

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Introduction

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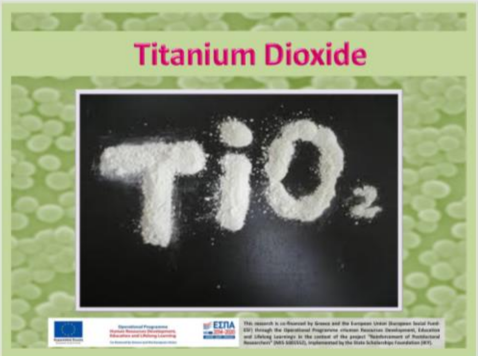
Titanium Dioxide
TiO2

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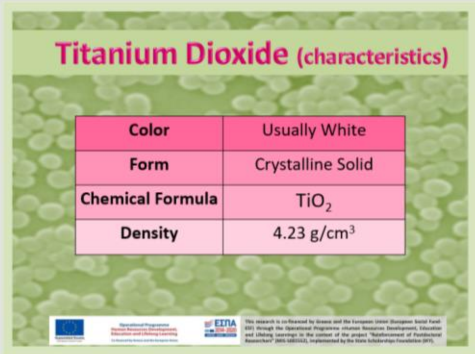
Titanium Dioxide (characteristics)
Color | Usually White
Form | Crystalline Solid
Chemical Formula | TiO2
Density | 4.23 g/cm3

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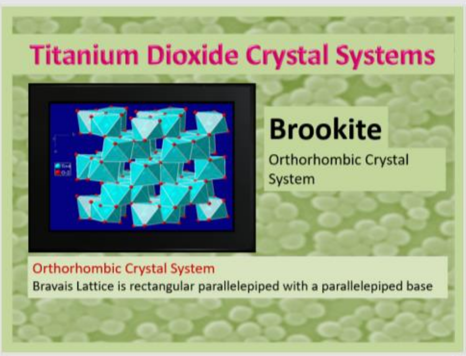
Titanium Dioxide Crystal Systems
Brookite
Orthorhombic Crystal System
Orthorhombic Crystal System
Bravais Lattice is rectangular parallelepiped with a parallelepiped base

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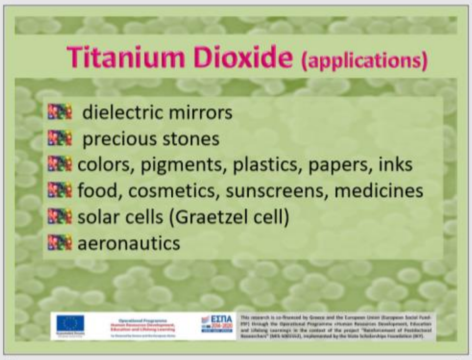
Titanium Dioxide (applications)
dielectric mirrors
precious stones
colors, pigments, plastics, papers, inks
food, cosmetics, sunscreens, medicines
solar cells (Graetzel cell)
aeronautics

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Titanium Dioxide
(biomedical applications)

- artificial bone implants
- artificial limbs
- dentistry
- arterial stents, valves

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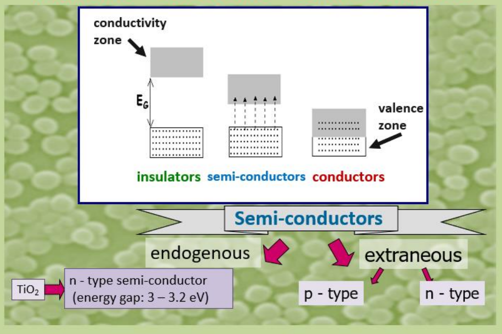
Insulators - Conductors – Semi-conductors



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Photocatalysis

«photocatalysis is the acceleration of a photo-reaction in the presence of a catalyst»

Mills and Hunte, 1997
N. Seprone and A.V. Emeline, 2002

«process of ROS production by aquatic medium in the presence of a solid heterogenous catalyst and irradiation with light of specific and appropriate wavelength»

K.T. Pickering 1997
R.J. Bull 2001

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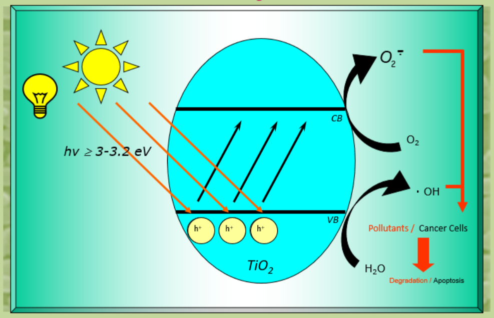
Photocatalysis Process



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Characteristics of an ideal photocatalyst

- photo-active
- able to be used in a wide range of electromagnetic spectrum (UV and visible light)
- photo-stable
- low cost
- non-toxic

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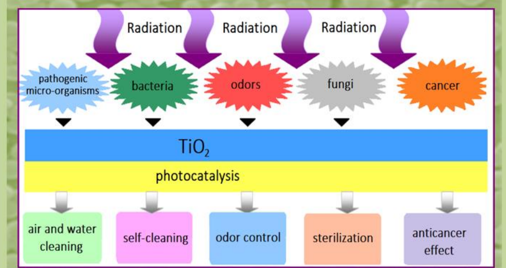
Titanium Dioxide Photocatalytic Applications



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Cancer Statistics

American Cancer Society 2011

MEN		WOMEN	
(% incidence)	(% mortality)	(% incidence)	(% mortality)
Prostate Ca (33%)	Lung Ca (31%)	Breast Ca (32%)	Lung Ca (27%)
Lung Ca (13%)	Bladder Ca (10%)	Lung Ca (12%)	Breast Ca (15%)
Colorectum Ca (10%)	Colorectum Ca (10%)	Colorectum Ca (11%)	Colorectum Ca (10%)
Bladder Ca (7%)	Pancreas Ca (5%)	Endometrial Ca (6%)	Ovarian Ca (6%)
Skin Melanoma	Leukaemia (4%)	Non - Hodgkin	Pancreas Ca

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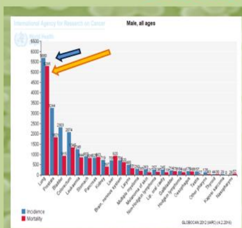
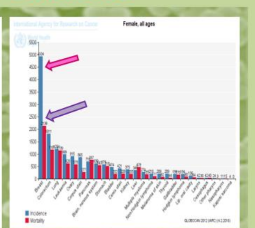
Cancer Statistics





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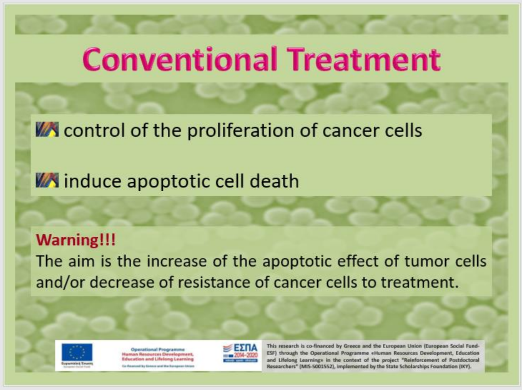

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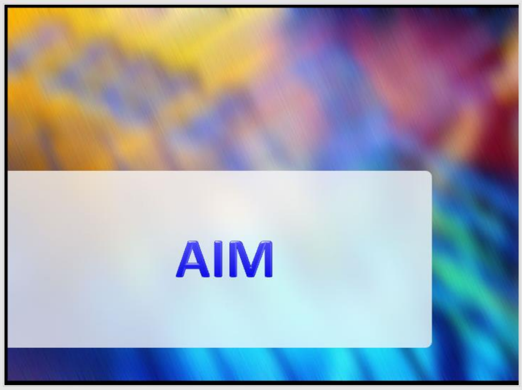

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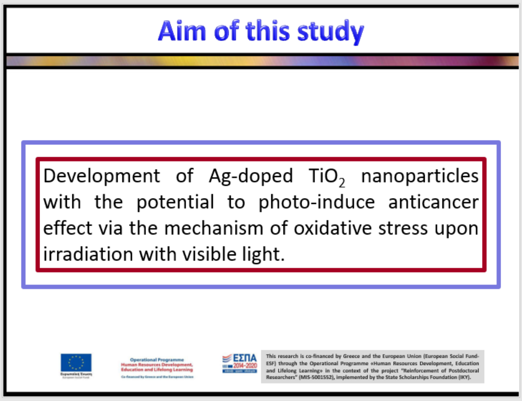

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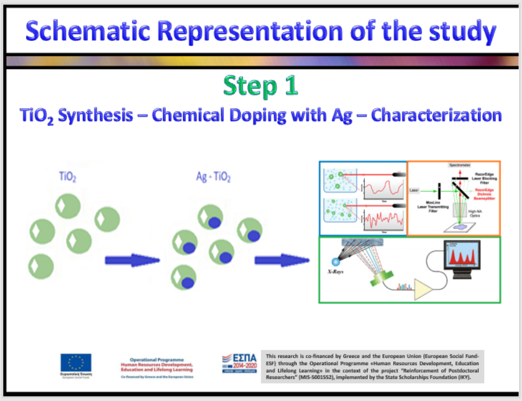

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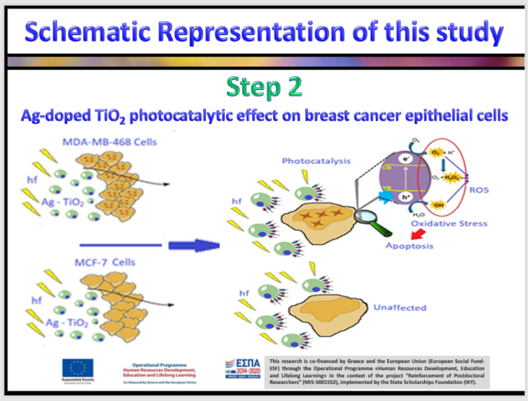

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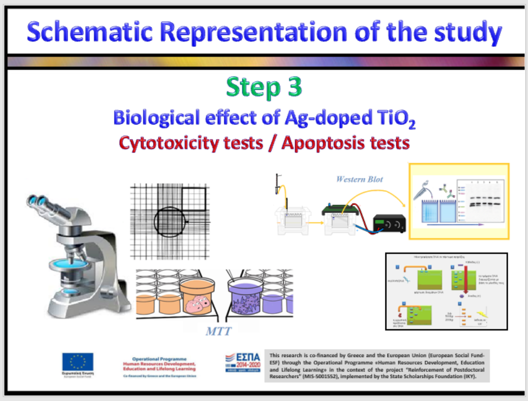

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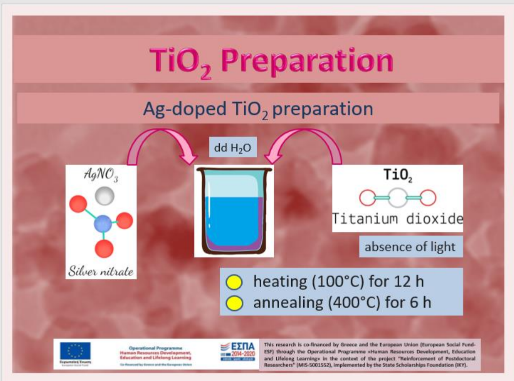

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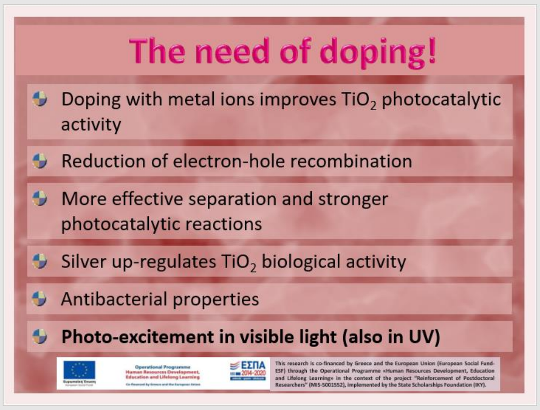

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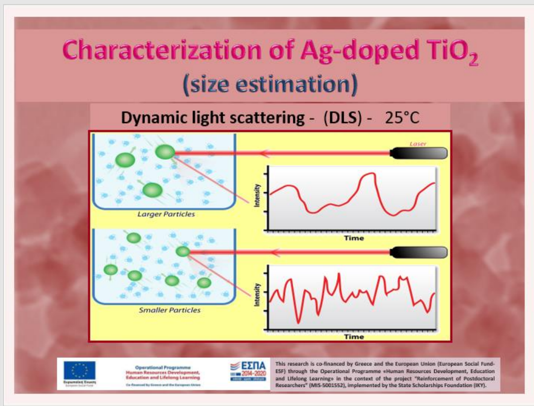

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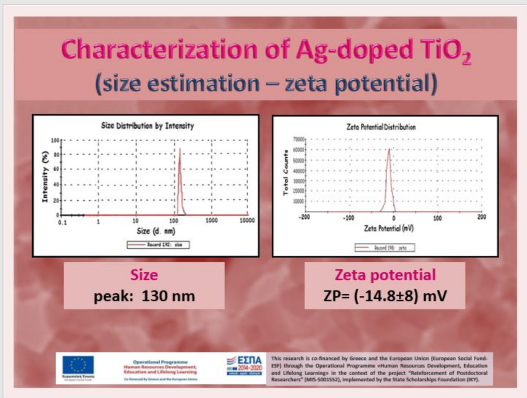

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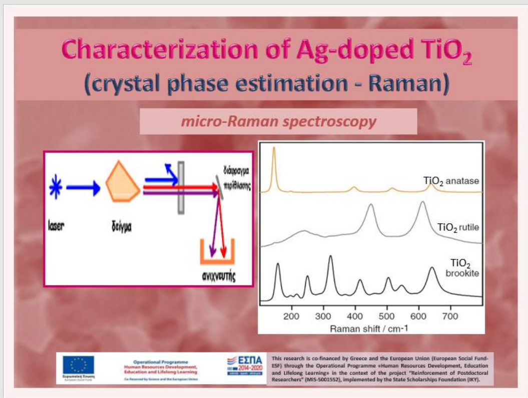

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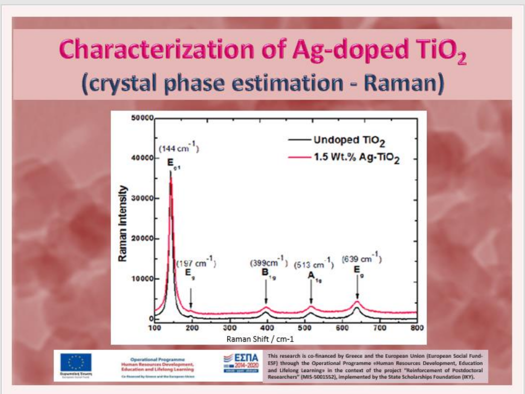

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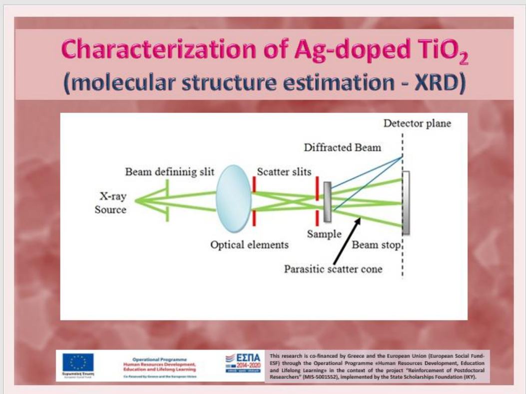

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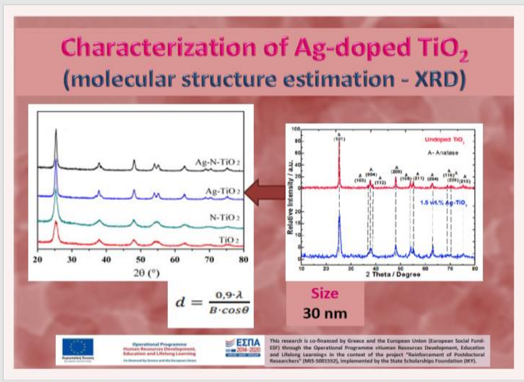

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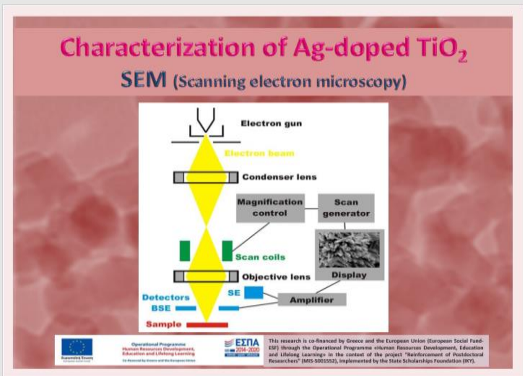

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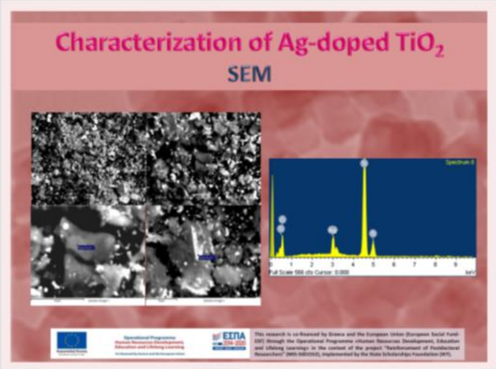

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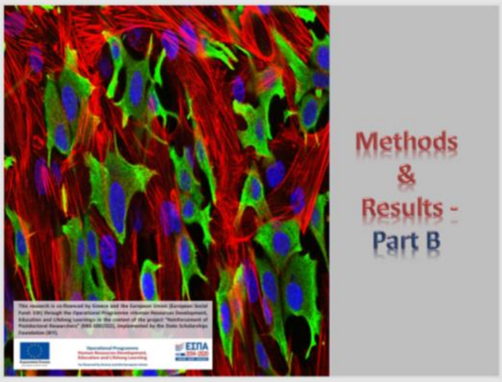

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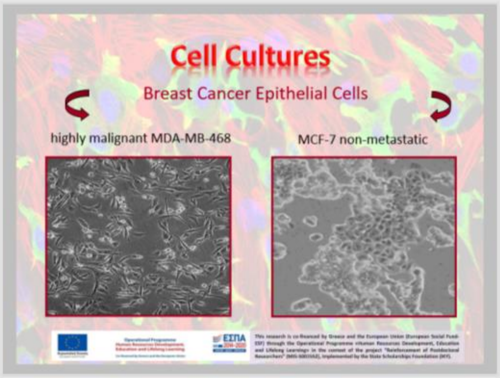

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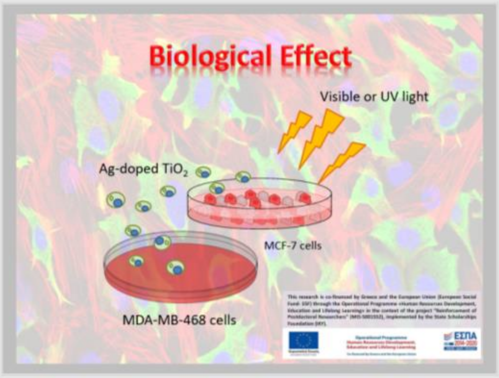

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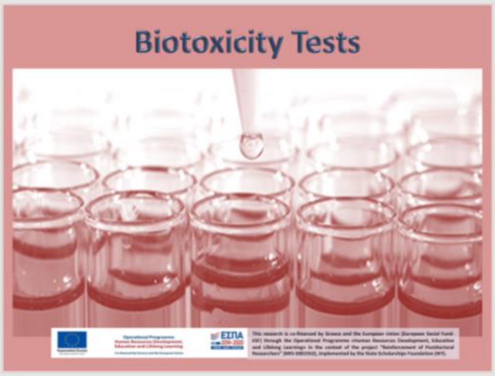

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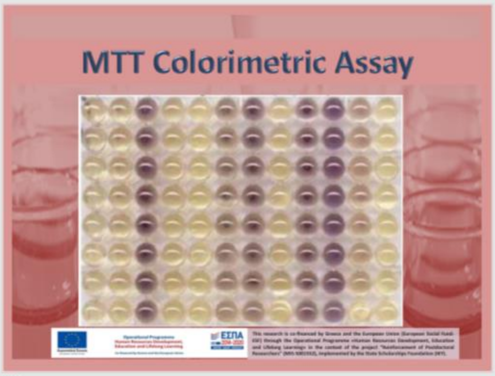

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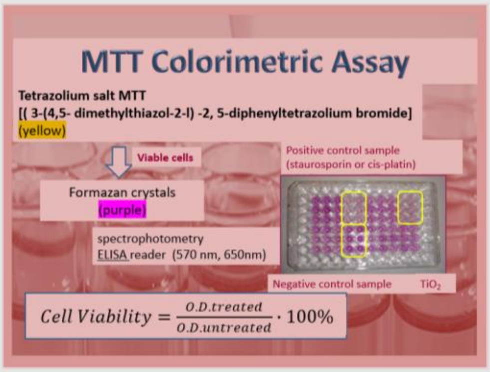

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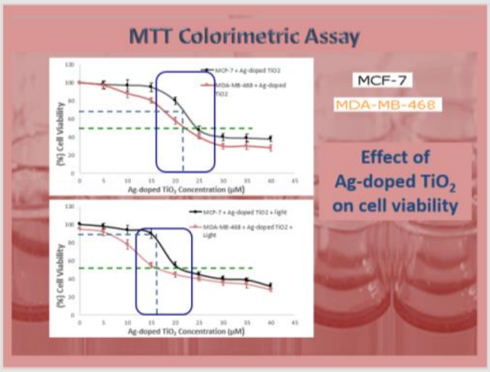

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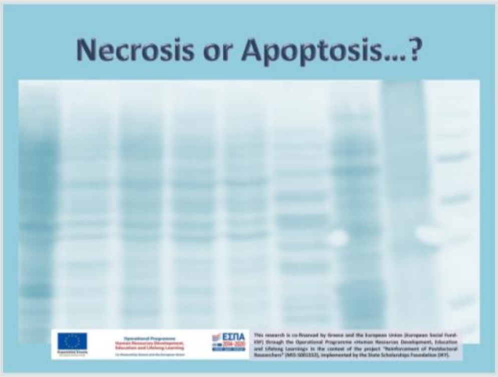

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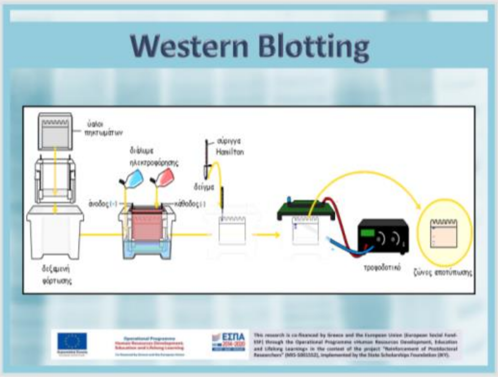

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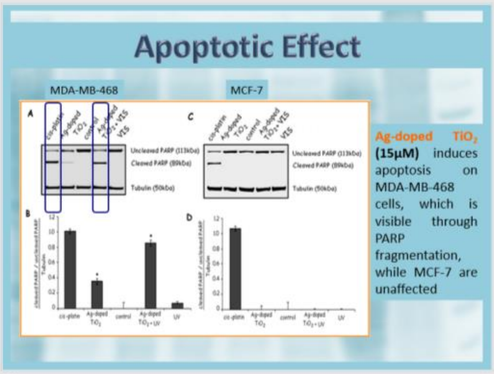

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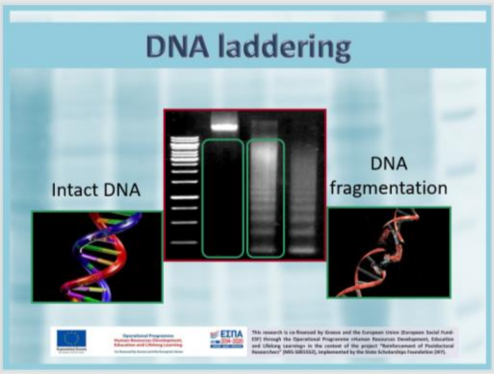

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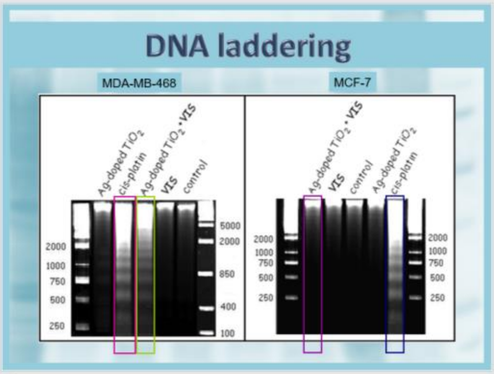

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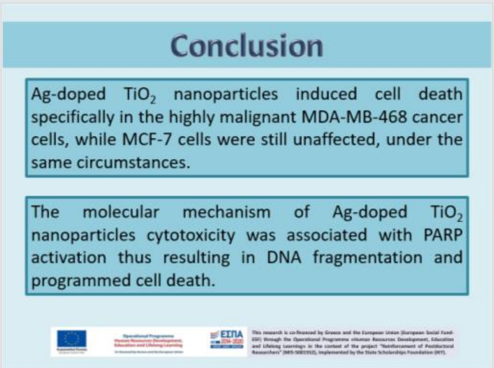

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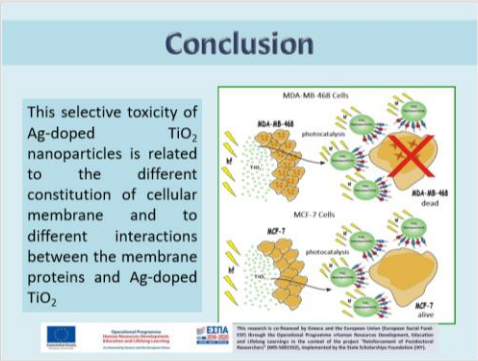

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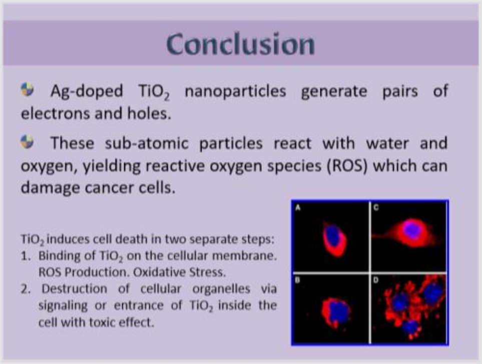

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Future
Perspectives

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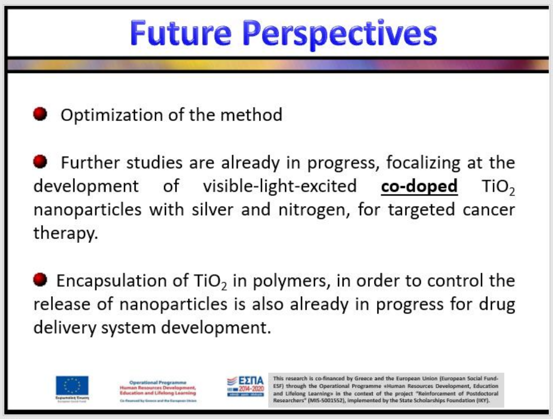
Future Perspectives
Optimization of the method
Further studies are already in progress, focalizing at the development of visible-light-excited co-doped TiO2 nanoparticles with silver and nitrogen, for targeted cancer therapy.
Encapsulation of TiO2 in polymers, in order to control the release of nanoparticles is also already in progress for drug delivery system development.

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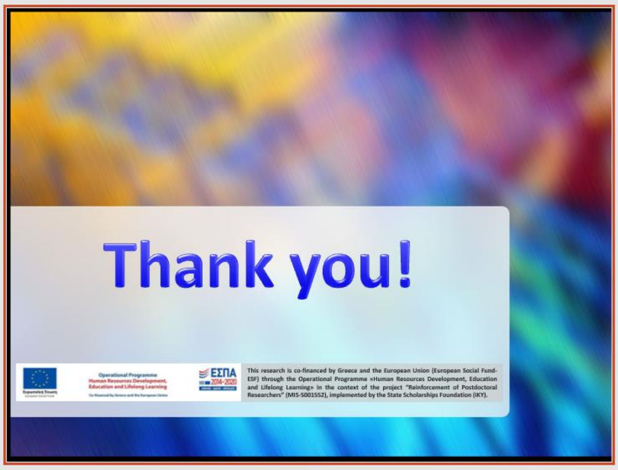
Thank you!

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