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**Design and development of novel layered nanostructured hybrid materials for environmental, medical, energy and catalytic applications**

Potsi, Georgia

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# **Design and development of novel layered nanostructured hybrid materials for environmental, medical, energy and catalytic applications**

This PhD thesis is the result of an effort that started 4 years ago at the Ceramics and Composites Laboratory in University of Ioannina and was continued at the Zernike Institute for Advanced Materials in University of Groningen.

The front cover page designed by Antonios Kouloumpis represents an aluminosilicate clay structure and a graphene sheet. The photos used show: Pfizer's Unisom Diphenhydramine pills, (source Flickr, licensed under the Creative Commons Attribution), an Industrial Refinery Petroleum Plant, (source <https://pixabay.com>, free photo), a close shot of wind turbines at a wind farm (source: <http://www.public-domain-image.com/public-domain-images-pictures-free-stock-photos/wallpapers-public-domain-images-pictures/a-close-shot-of-wind-turbines-wind-farm.jpg>, public domain, not copyrighted, no rights reserved, free for any use).

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# **Design and development of novel layered nanostructured hybrid materials for environmental, medical, energy and catalytic applications**

## **PhD thesis**

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University of Groningen  
on the authority of the  
Rector Magnificus Prof. E. Sterken  
and in accordance with  
the decision by the College of Deans.

and

to obtain the degree of PhD of  
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on the authority of the  
Rector Prof. G. Kapsalis  
and in the accordance with  
the decision of the General Meeting  
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Double PhD degree

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&  
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Ioannina

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Keep Ithaka always in your mind.  
Arriving there is what you're destined for.  
But don't hurry the journey at all.  
Better if it lasts for years,  
so you're old by the time you reach the island,  
wealthy with all you've gained on the way,  
not expecting Ithaka to make you rich.

Ithaka gave you the marvelous journey.  
Without her you wouldn't have set out.  
She has nothing left to give you now.

And if you find her poor, Ithaka won't have fooled you.  
Wise as you will have become, so full of experience,  
you'll have understood by then what these Ithakas mean..

By C. P. CAVAFY

Translation by E.Keele

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