

# Novel piezoelectric materials based on self-assembled peptides and their applications in medicine: an overview

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## Abstract

Diphenylalanine (H-Phe-Phe-OH, FF) is one of the self-assembling peptides that have recently become the subject of intense research in the field of nanomaterials due to their ability to spontaneously form well-ordered structures: nano- and microtubes, nanospheres, nanofibrils, films. Peptide nanostructures possess unique biological and physical properties such as biocompatibility, high rigidity, noticeable thermal stability, interesting electronic, nonlinear optical and photoluminescent properties, as well as exceptional piezoelectric effect and pyroelectricity. Despite the promising prospects for self-assembling peptide systems, their practical application is still limited due to the difficulty in obtaining stable, high-performance devices. Major problem is an inability to control the self-assembly process to produce dense films with controlled orientation and thickness.

This lecture will discuss and analyse the emerging physicochemical, dielectric, optical, and mechanical properties of peptide assemblies, focusing on their understanding and further improvement based on our experience in this field. We will compare the technological potential of their application in future devices, such as controlling the self-assembly of peptides to develop unique nanostructures for biocompatible acoustic transducers, tiny biosensors based on piezoelectric effects, energy harvesters, etc. We will also discuss how modelling can help experiments to create customized functional peptide nanostructures with controlled morphology.

## About the presenter

Dr Svitlana Kopyl received PhD degree in Physical chemistry (2005) from Institute of General and Inorganic Chemistry (Kyiv, Ukraine). Over a period from 2006 to 2009 she was JSPS fellow in the Institute of Biomaterials and Bioengineering, Tokyo Medical and Dental University (Japan). She participated in a few international projects and worked

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Since 2015 she is Researcher in the University of Aveiro, Portugal. Her current research interests are related to the investigation of ferroelectric biomaterials and energy harvesting systems. She is highly competent in different experimental methods for surface and structural analysis and for determination of electrochemical, magnetic, and spectroscopic properties. She has published about 50 papers in international journals and presented her research work at numerous international conferences as an invited speaker.