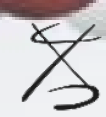


Speaker

Dr. Stavros Nicolopoulos

NanoMEGAS SPRL, Brussels-Belgium, Director



NanoMEGAS
Advanced Tools for electron diffraction

When: Mon. Nov 16th 2015 15:00~16:00 **Where:** Faculty of Engineering 大会議室

“Advanced TEM electron diffraction studies: from texture mapping to complex structure determination of pharmaceuticals and proteins”

Abstract: Transmission Electron Microscopy (TEM) has been greatly developed over the last 30 years by relying on applications focusing mainly on high resolution imaging; in the last decade Cs corrected TEMs made it possible to achieve sub-nanometer resolution. By contrast, TEM applications based on diffraction data did not grow at a similar pace.

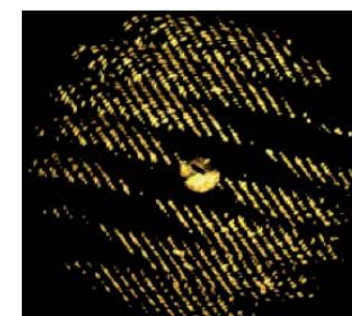
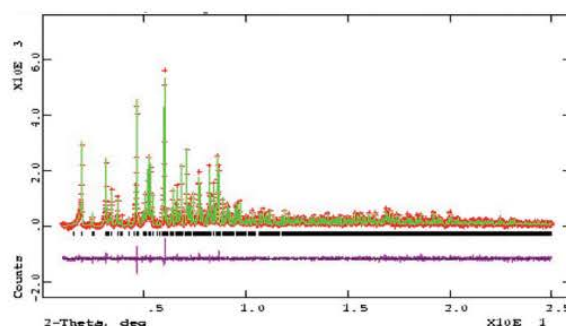
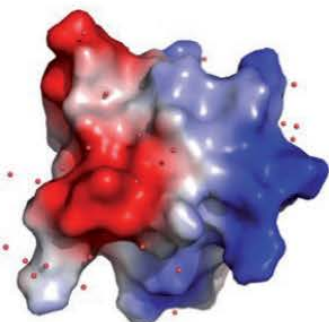
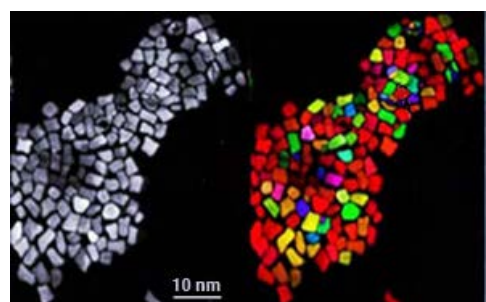
In the wake of the pioneering work of Vincent and Midgley in Bristol UK (1994) who developed Precession Electron Diffraction (PED) and the arrival on the commercial market of PED tools (NanoMEGAS, 2004), electron crystallography studies to solve ab-initio unknown structures started to develop rapidly. 3D diffraction tomography and texture imaging of nanocrystals, are among the most promising PED developments in TEM.

By using PED, new other methods of structure analysis could be developed :

--3D Diffraction Tomography (ADT 3D) technique (Kolb et al), permitted in the last few years (2010-15), to solve more than 200 previously unknown structures (from complex zeolites and minerals to metals and alloys), including very recent work on protein structures (JP Abrahams et al, Nanenga et al). Our team, using a very sensitive direct detection detector has achieved to solve structures of single nano-crystals of various beam sensitive pharmaceutical crystals (carbamazepine and nicotinic acid) without using cryo-cooling techniques, opening this way new perspectives in polymorph studies in pharmaceutical research. Carbamazepine is a drug used primarily in the treatment of epilepsy and is used as a second line agent in bipolar disorder. Nicotinic acid (known also as B3 vitamin) is an organic compound that reduces the production of triglycerids.

--Another key PED-based application in TEM, is the ASTAR technique that makes it possible to obtain orientation and phase mappings at 1 nm resolution for a variety of materials (metals, alloys, semiconductors, oxides etc..). This technique has allowed us recently to get deep insight into the human bone biomineralization by revealing bone texture. This consists of formation of small 3-5 nm nano-crystalline needle-like hydroxyapatite crystals, randomly textured during the initial bone mineralization. This method also permitted to understand the texture details of magnetic nanoparticles (5-20nm) used at biomedical/drug delivery applications.

As a result of all those PED related tool developments, effective use of novel electron diffraction applications can turn any TEM (100-300 kv) into a very powerful analytical probe, complementary to Synchrotron facilities.



Free and open to all faculty, students, and the public.

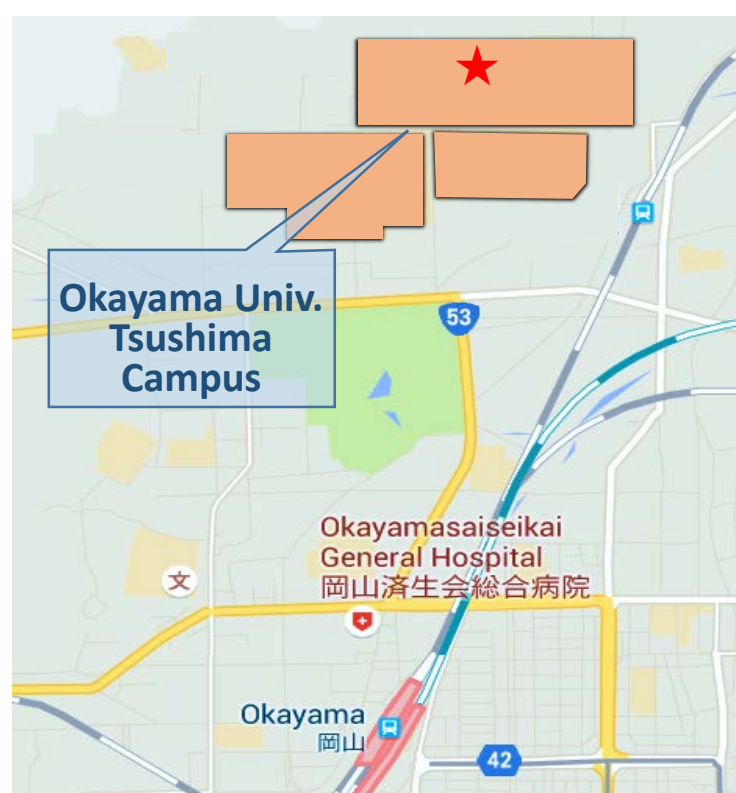
For further information, please contact

Bernard CHENEVIER, Senior URA email: bernard-chenevier@cc.okayama-u.ac.jp

About the speaker

Dr. Stavros Nicolopoulos holds a B.S. in Physics (University of Thessaloniki, Greece) and a PhD in Materials Science (University of Grenoble, France). He worked as Associate Professor at Complutense University (Madrid, Spain) from 1991-96 dedicated to biomaterials research at the School of Pharmacy. He worked from 1996 to 2004 in Philips Electron Optics as TEM application specialist and from 2001 as President of FEI (former Philips Electron Optics) in Spain. He is President and co-founder of the NanoMEGAS SPRL company based in Brussels, the first company in TEM microscopy field that commercialized innovative precession electron diffraction devices/applications worldwide. He leads NanoMEGAS SPRL Company with 13 other scientists and technical collaborators. Precession electron devices in electron microscopes (TEM) first developed and commercialized by NanoMEGAS in 2004 were critical to allow solving nm size crystal structures by TEM precession diffraction, rendering the technique as complementary to Synchrotron X-Ray powder diffraction applications.

Scientific Contribution: He is author/co-author of more than 60 international peer-reviewed journal publications, 42 congress proceedings publications, and participated in 52 invited lectures. Since 2004 he is “Consultant of International Union of Crystallography (IUCr) Commission on electron crystallography” and has participated in/ co-organized 35 international electron microscopy/crystallography workshops worldwide since 1998.



Okayama University Tsushima Campus
Faculty of Engineering 1st floor 大会議室
3-1-1 Tsushima-naka Kita-ku Okayama-city

〒700-8530 岡山市北区津島中3-1-1

岡山大学津島キャンパス
工学部1号館 1階
大会議室

